May 1955

Machine and Tool BLUE BOOK





"... every worker a sub contractor."

Page 137

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A HITCHCOCK PUBLICATION



These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18"x 18"; and No. 24, Capacity 24" x 24") were basically designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

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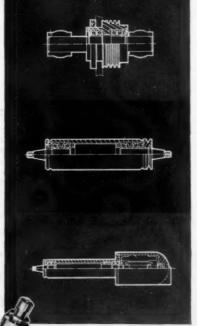
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May, 1955 Encircle No. 203 on Card, Opposite Page 65





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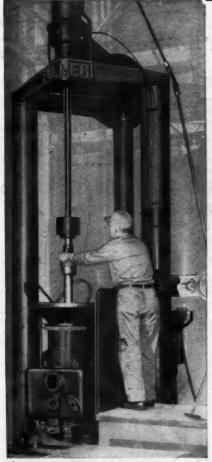


Photo taken in Continental Gin Co. Birmingham, Ala., honing Diesel cylinders.

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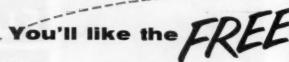
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Milling two sides simultaneously, on cast iron pump parts at the rate of 60 per hour, employing the index base method of milling on a CINCINATI No. 2-24 Automatic.

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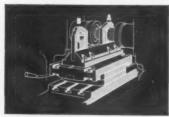
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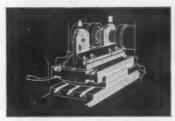
in this Attachment Setup



Milling the part in fixture A. Plenty of time to reload fixture B.



Swiveling the Index Base table at end of cycle.



Milling the part in fixture B. Plenty of time to reload fixture A.

CINNATI

Cost wise, the all-Cincinnati equipment illustrated here actually does give you something for nothing. The trick is accomplished with a setup that takes advantage of the free time during the feeding stroke of the table. Drawings at the left show how it works. JA CINCINNATI No. 2-24 Duplex Automatic Milling Machine is equipped with a Cincinnati Index Base (standard attachment) for the operation of milling two sides of pump parts. The entire production cycle proceeds along the following pattern: at the completion of the milling cut, the table automatically returns to starting position, the operator indexes the Index Base table 180°, and the cycle automatically repeats. Notice that there's no time allowance for handling the work. This item, usually a considerable cost factor, is free; accomplished while the cutters are at work. This is a typical example of cost reduction by CIN-CINNATI No. 2-24 Automatic Milling Machines. They have many features of value in operating at rock-bottom costs:

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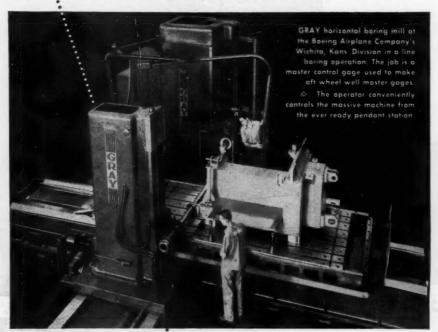
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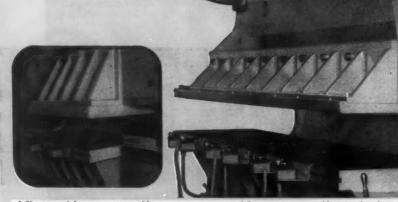
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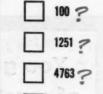
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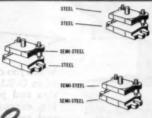


31,104 >

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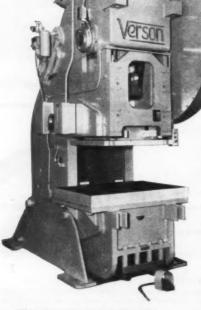
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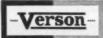


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Instruction Plate



Tail Stock Shear Wiper



Name Plate



Transmission Cover



Dirt Guard

DAYTON ROGERS

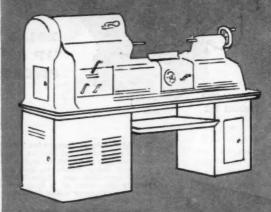
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Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.



Vertical adaptor for Surface Grinders. Grinding small slots



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. . . specialists in designing and building custom-made presses. In addition, Lempco has a full line of standard presses. So, whatever your press needs may be, special or standard, you can depend on Lempco to meet your requirements—exactly. Lempco engineering service endeavors to answer all inquiries within 48 hours.

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Lempco has designed and built for a number

This is just one of many special presses that



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of each other.

THE PRODUCTION COSTS! **ECONOMIZE** with OLIVER DIE MAKING MACHINES

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High and unnecessary die making costs will be eliminated . . . production schedules and higher product standards maintained . . . when you equip your toolroom with OLIVER DIE MAKING MACHINES. With an Oliver in your service, smoother production will be assured . . . higher output certain . . . lower die making costs a fact!

OLIVER DIE MAKERS are ECONOMICAL . they save you time . . . are easy to operate . . . do not require skilled labor. Many plants have been using Olivers for more than 30 years because they produce dies with more

OLIVER DIE MAKERS are EFFICIENT . . . prove themselves every day in more than 10,000 installations around the world by consistently effecting cost reductions of as much as 60% through simplifying sawing, filing and lapping operations. OLIVER DIE MAKERS are ACCURATE . . . engineered, designed and built by Oliver of Adrian, the precision-made Olivers have been tried and tested for four decades. Unsurpassed for accuracy on Dies, Production Filing, Experimental Work, Metal Patterns, Cams, Gages and Templates, OLIVER DIE MAKERS are considered essential wherever precision work is constantly required.

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REMOVE STOCK TO PRECISION LIMITS - FAST .. ROUGH AND FINISH IN ONE PASS!

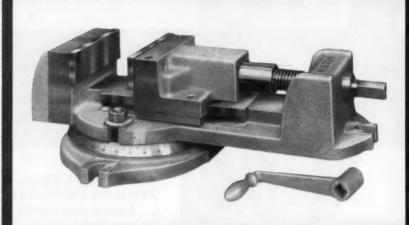
The scope of Broaching has broadened in recent years. Many broaching operations do precision work in far less time than other metal-cutting methods.

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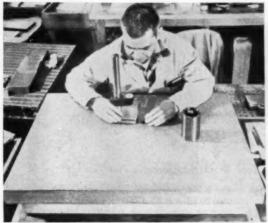


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This 4-ledged Taft-Peirce Gronits Surface Plate is made of high quality Blue-White Granits. Evenly distributed quarts and feldspar grains stand up under long, hard wear. The micco flakes are extremely flee. The plate is free from residual stresses and will not distort with temperature changes. T-P peculsion grinding and tapping produce the most occurate surface available to industry today.



This photograph of gray granite shows the coarse distribution of quarts and feldsper grains, and the larger mica flakes. These clusters of mica wear rapidly and flake out, making larger pith and destroying surface accuracy.

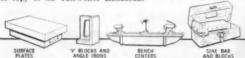
How to Select a Granite Surface Plate

More Tips from TAFT-PEIRCE on Toolroom Equipment

The word "Granite" is at best a vague specification for surface plates. There are many types of granite plates available, and not all are particularly well-suited for long and accurate service. Some granite surface plates wear less, chip less, maintain their accuracy longer than others. Fortunately it is easy to distinguish various kinds of granite by their surface appearance. The four unretouched photographs (shown at the right) of several types of granite show what to look for when judging the quality of a granite surface plate.

Best quality granite is almost indestructible. Taft-Peirce Granite Surface Plates are made of very fine-grained Blue-White Granite. Heavy objects dropped on the surface barely powder the stone at point of impact.

All Taft-Peirce Granite Surface Plates are carefully ground and lapped flat. More than 75 years of experience in making precision products assure maximum accuracy for layout and inspection work. For more information on Taft-Peirce Surface Plates, write for your free copy of the Taft-Peirce Handbook.





This pink granite has less mica and noticeably larger grains of quartz and feldspar, roughly scattered. Note the course, irregular texture of this granite.



Black diabase is composed therity of feldspar, horn-blende, pyroxene, and black mica, with little or no quartz. These minerals are not quite as hard as quartz, and the mica, especially, flakes out with



This photograph of a Tart-Peirce Granile Serface Place show the close, finegrained texture of quartz and feldspars and the aven distribution of estremely small mice particles. This Blue-White Granile from Westerty, R. I., will give long, accurate service.



THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. 1.

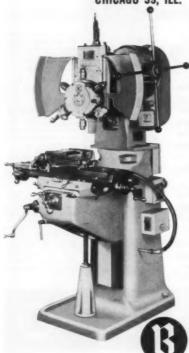


"have realized Illinois Tool Works considerable cost savings"

REPORT FROM:

ILLINOIS TOOL WORKS

CHICAGO 39, ILL.



The 2-A Flange Model Burgmaster is primarily used by Illinois Tool Works, Chicago, for drilling, tapping, counterboring, countersinking, and in some cases, end milling of holes in various metal cutting tools and miscellaneous machine parts. By using the 2-A Burgmaster head mounted on a milling machine base, Illinois Tool Works has realized considerable cost savings, namely:

1. In the cost of making drill jigs for small lot production runs (3 to 50 pieces) where repetitive accuracy must be maintained on hole locations.

2. In direct labor, as compared to laying out

2. In direct labor, as compared to laying out work, center drilling, drilling, then tapping on a conventional drill press.

3. In reduction of scrap costs, because of the consistent repetitive accuracy maintained by the precision feed screw in locating hole dimensions.

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Illinois Tool Works is one of the world's foremost producers of metal cutting tools such as hobs, shaper cutters, form cutters, broaches and milling cutters. It is also a leading producer of special measuring machines for inspecting cutting tools and production gears.

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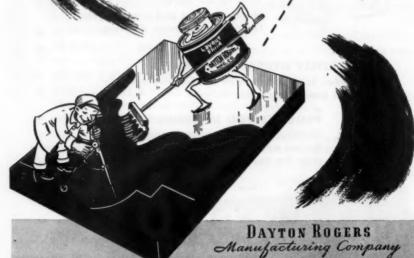
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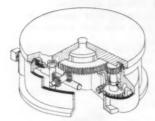
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new



HYDRAULIC INDEX TABLE WITH BUILT-IN SAFETY FEATURES

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Merely a worm and a worm gear. Notice the cut-away drawing.

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The Index Table is driven by a fluid drive motor to provide smooth operation.

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Electrical failures in any unit—engaging fixtures with drill head, while the table is in operation—stops the table automatically.

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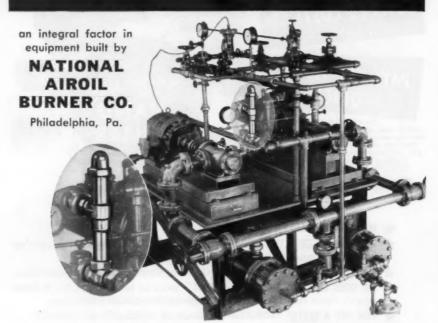
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MACHINE and TOOL BLUE BOOK

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U. S. Vertical Miller



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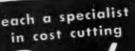
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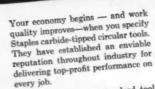
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Could you do better work if you owned better tools? Of course you could! You'd get better pay! That's why "DOIT" URSLF is so important! Up to now you may not have felt you could afford to buy such tools as these. But "DOIT" URSLF, a remarkable new approach to the manufacture of toolmaker's tools, cuts costs to the bone . . . allows you to own the very finest tools for pennies where otherwise you'd have spent dollars.

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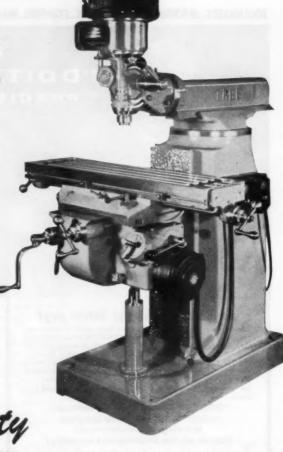
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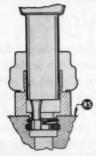
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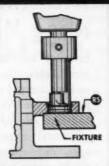
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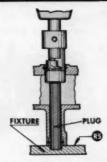
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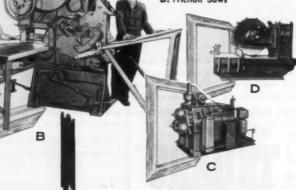
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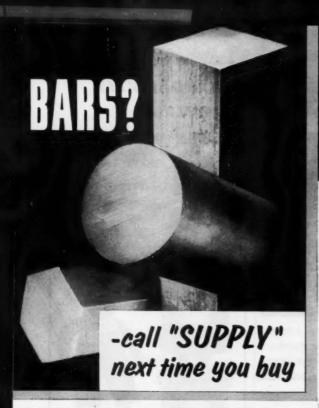
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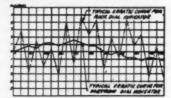
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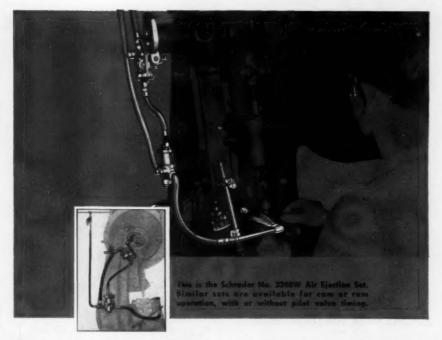
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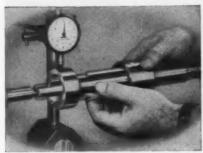
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.. "More Use per Dollar"

Look for a wheel specially engineered and bonded to give you maximum cutting efficiency for your particular cutoff operations.

Safe, fast, clean metal cutting for sustained periods with a wheel that cuts freely, means savings in both time and money. You should look for a wheel that permits you to cut at high speed without burning, one that will leave no burr or discoloration and will last longer. To give you these advantages, the wheel you buy should be custom-bonded for your specific cutoff job . . . to assure smooth, freecutting action whether you work with hardened or soft steel, light gauge tubing, critical alloys, etc.



Specify the wheel designed specifically for improved cutting on your job ... specify Manhattan Cut-Off Wheels.



MANHATTAN CUT-OFF WHEELS

Manhattan developments in both rubber and resinoid bonds have greatly increased the cutting efficiency and long life of Manhattan Cut-Off Wheels. In factories where records are kept of the number of cuts per wheel, Manhattan wheels have proved they do a better job, longer . . . permit faster, cleaner cutting on all types of metals. Manhattan Cut-Off Wheels are manufactured in the widest range of types and sizes. Manhattan sales engineers will aid you in specifying the exact one for your operations and show you how you can save time and money -get "More Use per Dollar"-at your plant with Manhattan Cut-Off Wheels and other types of high speed, heavy duty wheels.

BM-827-8



Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose Fan Belts • Brake Linings & Blocks • Clutch Facings • Packings • Asbestos Textiles Engineered Plastic, and Sintered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

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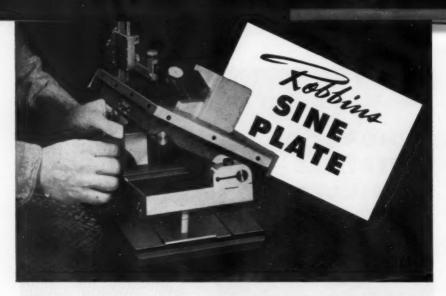


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America's Oldest File Manufacturer
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FAST ANGULAR INSPECTION SET-UPS

... with repetitive accuracy

When minutes mean money, you can realize outstanding economies in your plant with the Robbins Sine Plate.

Using your own standard gauge blocks, angular set-ups take just a few minutes. And, you are certain every set-up is accurate, too, because Robbins Sine Plates are built to precision tolerances on the sine bar method.

For quick, accurate angular set-ups on milling, boring and inspection operations of large work pieces—Robbins has introduced a new 24" square sine plate. This versatile unit is rapidly replacing homemade holding and inspection devices. It also eliminates costly construction time for special "fixed-angle" fixtures which are good for only one job.

If you want to cut costs—meet the most rigid dimensional requirements, then the Robbins Sine Plate is the answer. Get complete details. Write for your free illustrated catalog and price list today.

OMER E.

Kobbins

COMPANY
Detroit 39, Michigan

Dept. A-5 24800 Plymouth Road

Saves 4 minutes per casting



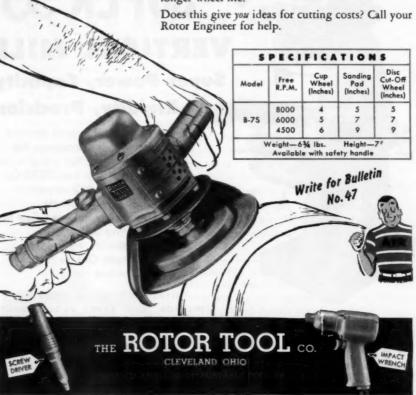
pays for itself in 91/2 weeks

JOB: Removing parting lines and general cleaning of large pipe fittings with disc cut-off wheel.

FORMERLY: An ungoverned, geared tool did the job . . . took 14 minutes per casting.

NOW: Lighter B-7 Vertical Grinder with direct-acting governor gives constant, controlled speed . . . cuts grinding time to 10 minutes.

RESULTS: Saves 4 minutes per casting. Used 75% of production time, tool paid for itself in 9½ weeks. Additional savings through lower maintenance, longer wheel life.





STEPS FAR OUT

WITH

the New

SUPER 55

VERTICAL MILL

Super Power, Capacity

Rigidity, Precision

Always in the Lead through constant improvements, Index announces this outstanding machine that will give you super performance in your BORING, MILLING and DRILLING operations—1½ H. P. Head—New spindle brake, Dynamically Balanced Cast Iron Pulleys and Drive System give 50% more capacity. Many more advantages. Get the facts. Write for Literature today.

OTHER MODELS—A COMPLETE

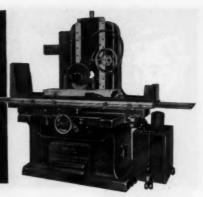
INDEX MACHINE Co.

SAO N. MECHANIC STREET

JACKSON, MICHIGAN

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MACHINE and TOOL BLUE BOOK

When the need is for SPEED and PRECISION



You need a GRAND RAPIDS GRINDER

Here is extra value, extra accuracy, extra highspeed performance. Every Grand Rapids Hydraulic
Feed Surface Grinder has a one-piece column and
base for vibrationless rigidity and permanent alignment between cross travel ways and upright headways. Both longitudinal table travel and cross feed
are hydraulically operated. On the larger machine
the wheel head is powered for rapid vertical travel.

The model 55 has longitudinal table speed of 125 fpm.!

All parts are machined to micrometric tolerances
and precision assembled for perfect freedom of
action and entire elimination of play. That's why
6 out of 10 of these machines are sold to firms already using Gallmeyer and Livingston grinding
machinery.



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Please send the following literature without obligation:

- ☐ Grand Rapids Surface Grinder Catalog
- ☐ Grand Rapids Universal Cutter and Tool Grinder Catalog

NAME

POSITION

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HEAVY DUTY GEAR TYPE PUMPING UNITS

Where pressure is needed for heavy oils, jet-like discharge, or unusual line restrictions. Favorite on 4 to 8 spindle drilling machines. 1/4 and 1/2 H. P. Illustrated SG4-2-04, 3GPM to 100 PSI.



GEAR PUMP UNIT

For single spindle drill presses and small lathes efficient operation at low cost. Positive flow. Thousands in use.

CENTRIFUGAL COOLANT PUMPS

New 6000 Series Pumps save space, eliminate bulky flanges and piping, drops through 41/2" dia. hole. Abundant volume-wide range of viscosities. Other models 1/25, 1/8, 1/4, 1/2 H. P.



CENTRIFUGAL **PUMPING UNITS**

Model SG1-4-25A. With hose, valve and nozzle.

For 90% of machine tools. Abrasive proof. A complete system, portaversatile. Other centrifugals 1/25 to 1/2 H. P.-2, 5, 10 & 38 gal. tanks.



Model H-2-3308A

FOR SPECIAL AND OFM APPLICATIONS

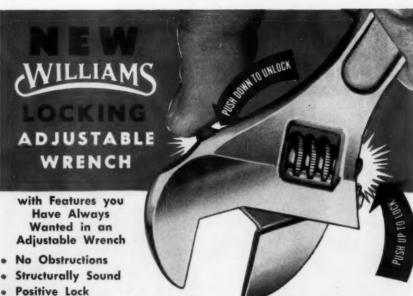
Over 182 Standard Combinations. Special units designed for your particular needs.





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- Rapid Adjustment
- One Hand Operation
- No Fumbling
- · Drop-Forged from Selected Alloy steel and Chrome Plated

AVAILABLE AT NO EXTRA COST

IN THREE MOST POPULAR SIZES

No.	Sixe	Capacity	List Price
8L	8"	15/6	\$2.45
10L	10"	11/8	\$3.10
12L	12"	15/16	\$4.50



J. H. WILLIAMS & CO., 428 Vulcan Street, Buffalo 7, N.Y.

Encircle No. 275 on Card, Opposite Page 65



Yoder Cold Roll Forming Machine with Shear Type Automatic Cut-Off and Small Slitting Line installed by Wolverine Mouldings, Inc., Lincoln Park, Mich.

for the Growing Business

As your business grows, new opportunities arise for drastic cost reduction through the use of cold roll formed parts or finished products.

Decorative metal mouldings is only one of a great many things you can make with a Yoder cold-roll forming machine.

For instance, you can economically make structural angles, channels, etc., up to ½ in. thick. You can form wide sheets or panels into cabinets or shells for refrigerators, ironers, lockers, radio and TV sets, etc. You can make virtually all the components for metal buildings, including trusses, joists, studs, siding, roofing, windows, and doors.

Edges of shapes can be folded in and over to make interlocking joints for cabinets, rolling doors, box and

tubular products.

You can, in addition to longitudinal forming, do perforating, notching, embossing, coiling, curving, welding, etc. Sections can be cut to length and ends given almost any shape, plain or fancy, by means of one or two Yoder automatic cut-off machines synchronized with the forming speed.

The Yoder Book on Cold-Roll Forming is an illustrated treatise on the art, the machines and many of the things they can do to reduce cost and increase produc-tion. A copy is yours for the asking. Consultations and estimates without cost or obligation.

THE YODER COMPANY 5509 Walworth Ave., Cleveland 2, Ohio

Complete Production Lines

* COLD-ROLL-FORMING and ouxiliary machinery

GANG SLITTING LINES for Coils and Sheets

* PIPE and TUBE MILLS - cold forming and welding

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MACHINE and TOOL BLUE BOOK

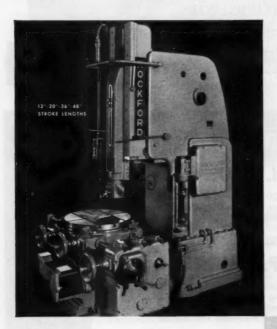
HYDRAULIC

fast, economical production calls for

HYDRAULIC

hydraulic slotters

HYDRAULIC



Hydraulic Drive is a natural for reciprocating-type machine tools. It provides smooth, powerful cutting, fewer moving parts, and longer useful life.

Hydraulic Slotters have power feeds and rapid traverse in all directions, and they may be equipped with Kopy-Kat Duplicators for fast, accurate duplicate-machining. When you modernize your production facilities plan on Hydraulic Shapers, Planers and Slotters to provide the fastest, most economical production methods.

ROCKFORD MACHINE TOOL CO.

2500 Kishwaukee Street

Rockford, Illinois





1/4 H.P. CONVERTICAL MILL HEAD

Only low cost mill head with quill travel attachment.

High speed medium-light operation.

For bench, floor and pedestal mills.

Fits milling machines with everarm 11/2" to 3".

%" end mill capacity.

\$24500



1/2 H. P. MILL HEAD

HEAVY DUTY MILLING ATTACHMENT

Fits milling machines with 3" to 5" overarm.

34" end mill capacity.

For vertical, horizontal and angular operations.

1 H. P. MILL HEAD

HEAVY DUTY MILLING ATTACHMENT

Fits milling machines with 3" to 5" overarm. 3" end mill capacity.

For vertical, horizontal and angular operations.

RUSNOK

RUSNOK TOOL WORKS

4840 West North Ave., Chicago 39, III.

DEALERS IN ALL PRINCIPAL CITIES

MILLING . DRILLING . BORING

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AMES



Over 16,000,000 cycles
without wear or loss of accuracy ...
how many more will they complete?

Several Ames Model 282 Long Range Dial Indicators with plain bearings are currently giving an amazing demonstration of performance and endurance under test conditions. After more than 16,000,000 cycles each, at 240 strokes per minute, 9 hours a day—they still have their original accuracy!

The reasons for this outstanding record? Simply high quality materials, simple basic design, rugged construction . . . and expert craftsmanship.

If you would like to have our recommendations on your measurement problem, send blueprints and specifications. And ask for your free copy of our catalog on Ames micrometer dial indicators and gauges.



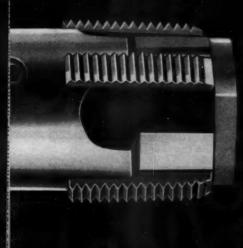
Representatives in B. C. AMES CO. 28 Ames Street principal cities. B. C. AMES CO. Waltham 54. Mar.

Migr. of Micrometer Dial Gauges . Micrometer Dial Indicators

new modern tap!

another

The new MODERN MS is a precision thread ground tap with adjustable chasers and available in five sizes ranging from 15/16" to 31/2".



MONEY BECAUSE:

- You do not lose size by regrinding and the chasers have a longer life than conventional non-adjustable taps.
- 2 Instead of buying new taps, you buy only chasers.

- Bulletin M 130 tells the story Mail this coupon today

CONSOLIDATED MACHINE TOOL COMPANY

modern tool works

ROCHESTER, NEW YORK

DIVISION OF FARREL BIRMINGHAM COMPANY, INC

CONSOLIDATED MACHINE TOOL CO.

565 Blossom Road, Rochester 10, N. Y. MODERN TOOL WORKS

Please send me without obligation your new Bulletin

M-130 giving full information on Modern MS Solid Taps.

Name



For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6" and 10" in diameter.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied—grind flanged studs or bushings—bearing spacers—forming rolls—cutters—convex or concave surfaces—punches or dies (radius or angle).

Lapping? Yes—and in micro inches. For the 6" and 10" table, lapping plates of 12" and 16" are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. Write for circular.

Major Vulcan Services



Surface grinder application.

only cross feed while the table is

rotating at infinite speeds be-

tween 40 and 100 RPM.

VULCAN TOOL CO.

720 HIGHLAND AVENUE

•

DAYTON, OHIO

Encircle No. 282 on Card, Opposite Page 65

MACHINE and TOOL BLUE BOOK



multiple mills speed production, save set-up time!



Photo courtesy of Mendelson McCarthy Co., Longbeach, Cal. When you get 5 milling machines for the usual price of 2 or 3 . . . set up "production line milling" that's easily adapted to an extremely wide range of parts . . . you also get important savings! So reports an aircraft parts plant that installed 5 GREAVES MILLS, saved capital investment, production and set-up time!

With extra-size tables, 60" x 12" having 34" travel, GREAVES MILLS can be set up for fast, precise machining of larger parts requiring longer travel. Attachments include: dividing heads, vertical and universal milling, rack cutting, slotting, rotary table and others.

Write for Price and Performance Comparison Chart

GREAVES MACHINE TOOL TO.

2600 EASTERN AVE., CINCINNATI 2, OHIO

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Americanis revised catalog 450 of Broaches, Broaching Machines and Broaching applications

TABLE OF CONTENTS

- Typical broaching applications
- Broach design data
- Typical broach sections
- Broach maintenance
- · Broach pull head types
- Basic machine types
- Standard keyway broach chart

write for your free copy today!

AMERICAN BROACH & MACHINE CO.

ANN ARBOR, MICHIGAN

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



Real

"Cost-Cutters"...

. . . Brown & Sharpe Cutters. The real cost of a cutter is measured by its performance and the length of its service life. That's why more shops prefer Brown & Sharpe Cutters. They're expertly made from the finest steels to give you more clean cuts per dollar invested. And, they're available in the widest variety of types and sizes including a complete line of end mills. Write for the New Catalog #36 to help you when ordering. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

BUY THROUGH YOUR LOCAL DISTRIBUTOR





.Cuts hardened tool steel Increased production over 5 TIMES*

Model M75 "Heavy Duty" cut-off machine. Capacity: $2\frac{1}{2}$ " solids, 4" pipe and structurals.

A large Detroit tool shop formerly teamed a power hack saw with a band saw for cutting hardened tool steel.

These two machines were replaced by a single model M75 cut-off machine. *Result . . . Model M75 increased production over 5 times.

Cost data proves tremendous economy of Stone machines compared to other methods.

- Cuts any metal ferrous or non-ferrous in 2 to 4 seconds per sq. inch.
- Used for cutting bar stock, pipe, tubing, structurals, etc.
- Leaves mill-like finish with tolerance less than ± .005; reduces the need for further machining.
- No change of characteristics or hardening of stock.

Exclusive Features by Stone

 Geared-in-head motor delivers maximum power to cutting edge for greatest efficiency.

- Self-centering vise presents least arc of contact for faster cutting, longer wheel life.
- Vise plate colibrated in degrees permits speedy changeover from straight cutting to angular cutting up to 46°.

Optional Features

- Semi-Automatic Power Stroke provides simpler operation, minimizes operator fatigue; gives up to 25% longer wheel life.
- Oil Mist Spray attachment for cooler, easier cutting increases saw blade life up to 400% on non-ferrous materials.

Machinery by Stone includes a complete line. Let us help you select the equipment which will enable you to realize greater profits on your particular operations. Our representative will gladly discuss your requirements with you. No cost or obligation; simply write or phone.

Stone Machinery Company, Inc.

"Cut off machinery by Stone . . . represented in every major industry throughout the world."

Let DAVIS out your Boring Costs 2 ways

WITH Standard Tooling ITEMS FROM INDUSTRY'S MOST COMPLETE LINE

IN STANDARD BORING HEADS ALONE DAVIS PRODUCES AND CATA-LOGS OVER 133 DIF-FERENT SIZES AND TYPES, Every boring job in your shop...rayardless of range, material or complexity...cun be done faster, cheaper and with greater precision, when you make Davis your tooling headquarters. That's because only Davis has both the complete line and broad machining experience to supply or design exactly the right tool for your work.

Davis tooling specialists help you immeasurably in selecting the right tool from industry's breadest standard line. Their unrivalled background of practical shop experience assures recommendations that exactly meet all your requirements for tolerances, finish, speeds, foods and maximum tool life at minimum cast.

TYPICAL OF DAVIS SPECIAL TOOL DESIGNS IS THIS EX-

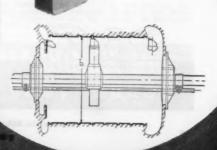
TENSION BORING HEAD WHICH BORES, FACES AND GROOVES A 51" DIAMETER

HOLE.

WITH Job-Engineered SPECIALS
FROM INDUSTRY'S FOREMOST DESIGNERS

Where work is beyond the scape of standard tools or where efficiency can be improved or costs reduced by combined operations, special fixturing, etc., the specialists in Davis Engineered Tooling Service will work with you in devoloping tools for even the most complex application. Consult your local Davis field engineer or send us complete work details for importial recommendations.

DAVIS
BORING TOOL DIVISION



THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING



RAPIDOR TURNING TOOLS feature INTERCHANGEABLE BLADES

ONLY ONE

ROUGHING



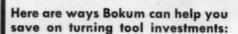
SEMI-FINISHING



FINISHING







- 1 Long tool life; blades only need be replaced.
- 2 1 holder for three different lathe operations; high speed steel and carbide-tipped blades available.
- 3 Cutting, clearance angles are built into the cutter; there's constant clearance throughout life of tool.
- 4 Shape of cross section remains constant.
- 5 Resharpen top face only.
- 6 No set-up problems.
- 7 Rigid, large chip removal cool cutting action.
- 8 For roughing, semi-finishing and finishing; for cutting off and threading.

Write Dept H for Catalog 454

PATENTS PENDING



BOKUM TOOL CO.

14775 Wildemere Ave., Detroit 38, Mich.

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Cherrying Attachment

Makes possible production of convex and concave shapes, ideal for producing drop forge dies, moids, cavi-ties, metal care boxes, etc.



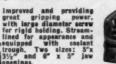


openings.





Holder provide means for bering holder provide means for bering holder up to 6" diameter; available for use on Bridgeport i HP Mili-ing. Drilling and Boring Attach-ment.







Bridgebort

offers great versatility through its wide range of ATTACHMENTS

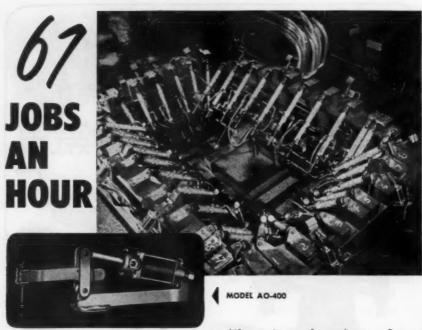
"Bridgeport Millers" in themselves are universally recognized as machines of outstanding utility. Their exclusive method of being able to drill, bore and shape over a wide area without changing set up, has contributed much to their universal acceptance through the convenience, economy and accuracy offered. But this is not

single purpose machines. Furthermore, many more jobs can be assigned to the "Bridge-port" with the result that many more productive hours are available from one machine.

Ask your dealer . . , or us . . . to show how you, toe, can apply Bridgeport Attachments to extend the utility of your machines. Ask also for literature on Bridgeport Turret Milling Machines.



Manufacturers of High Speed Milling Attachments and Turret Milling Machines



Lift a sedan roof panel onto a fixture. Clamp it tightly—in one operation! Drill 47 holes simultaneously into the roof edges. Unclamp. Remove panel and reload.

There's the production sequence of what could easily become a bottleneck at one automotive company. A fixture incorporating two unusual tools does the job. LAPEER AIR-OPERATED CLAMPS grab the panel rigidly, release upon demand. In the meantime, a battery of Keller Airfeedrills does the actual drilling in from 5 to 10 seconds. Two men handle 67 panels each hour even though most of their time is spent in handling.

Speed—accuracy—sureness—that's the Lapeer story.

You, too, can hold tight to tough jobs. It will pay to investigate Lapeer today.

Send for this FREE catalog.

MANUFACTURERS OF A COMPLETE LINE OF STATIONARY AND PORTABLE CLAMPS AND PLIERS

KNU-VISE PRODUCTS

LAPEER MANUFACTURING CO.

3048 DAVISON ROAD

LAPEER, MICHIGAN

WESTERN DIVISION: 422 Magnolia, Glendale, California . CANADIAN DIVISION: Higginson Engr., Hamilton, Ontario

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revolutionary

ogsdills

DEBURRING AND CHAMFERING TOOLS



"Revolutionary" is the word used to describe the new, easy and convenient method of removing burrs, fins and other hole irregularities. With Cogsdill BURRAWAY tools, even unskilled operators can do top quality work. This means lower costs, fewer rejects and faster production. For example, in multiple spindle machines, the BURRAWAY eliminates a hand or secondary operation. BURRAWAY is just as big a time-saver on single spindle machines and even on Portable Power Tools. You'll want to learn more about BURRAWAY. That's the reason a 12-page fact-filled and well illustrated booklet has been prepared. Send today for yours... no obligation.

PAT. NO. 2620689

Cogsdill

TOOL PRODUCTS. INC

12970 WEST EIGHT MILE ROA

Encircle No. 291 on Card, Opposite Page 65

. Talking About Die Sets



WITH
PHIL MARSHERS
Vice-President
The Producto Machine Co.

9 Ways to Savo on Special Steel Die Seto-Here are some nuggestions that can save you money on machine work and shorten delivery time when you order special seel die sets: 1. Specify flame-cut edges, rather than machined edges, where possible 2. Where close limits are not important, flame-cut clearance holes or cut-outs should be specified. Unnecessary machining increases cost, 3. For cut-outs requiring more accuracy than flame-cutting but less than machining, specify "saw-cut" to keep costs down. 4. On all types of cut-outs, keep radii in corners as large as possible.

5. Try to keep hole location tolerances as liberal as possible to reduce machining time.

6. On pin supports or bushing supports, welded construction is less expensive than dowelled and bolted construction. 7. On whold-down pads or flanges, the clamping slots should be flame-cut. 8. Bolt slots machined in pads should have one radius on the inside instead of two small radii corners. 9. Avoid special pins or bushings wherever possible.

A New Lock in Die Sets-In case you haven't noticed, there's a new look in die sees. The new design offers these improvements: much more layout and mounting area on punch holders and die holders; maximum strength;



assurance of uniformly accurate location of pin and bushing holes. In addition, we felt what clean lines designed into a ret would show the tooling to better advantage and make the completed unit look more like the precision instrument it really is. So you see, a dies et can now make your work easier and your product better looking.

Proper Lubrication of Dis-Set Pins and Dushings helps to prevent seizing and galling, adds substantially to the life of your die sets.

A new flexible reservoir type lubricator has abeen developed for this purpose. The guide bushings dip into the reservoir with each adown stroke of the press, coating the entire pin with lubricant on the return stroke. It's an inexpensive way to get thorough lubrication for long periods of time without need of constant attention. Other lubrication methods will be disrussed at a later date.



One of many major foundry improvements at Products is this new continuous pour operation which also provides continuous slag removal. The 12,000-ld else is though below is an example of the top-quality sets obtainable through Products' "under-our-roof" service-pattern, casting and machining.

WHERE A BETTER DIE SET STARTS

Producto's newly-modernized foundry enables you to get higherquality die sets... faster.



So extensive have been foundry improvements at Producto that little of the equipment or methods of two years ago remains. A new and larger cupola, stack, slag disposal unit, continuous-pour ladle, abrasive cleaning machine, sand conditioner, and conveyor systems for sand and molds have been installed.

FOR YOUR DIE SET REQUIREMENTS, THIS MEANS YOU GET:

HIGHER QUALITY sets, since Producto can produce a laboratory-controlled iron and steel mixture free of hard spots and blow holes.

PASTER SERVICE on catalog semi-steel sets, because combination of internal foundry and machine shop makes possible a full inventory at all times. Time from order to shipment never exceeds three days.

FASTER SERVICE on special semi-steel sets. A modern pattern shop in the plant expedites making patterns for your specials. No dependency on outside suppliers.

The improved foundry is but one of the reasons more and more die set users are specifying Producto. For precision die sets fast, call your nearest Producto branch.

THE PRODUCTO MACHINE COMPANY
960 Housatonic Avenue, Bridgeport 1, Connecticut

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

		Detroit L1 6-7600		
Chicago ES 8-3307	*	Kansas City VI 1162 Los Angeles TR 9825	-	Philodelphia MO 4-1010
Cleveland SU 1-6158		Los Angeles TR 9826	TR 9826	Rochester GL 1810
Daylan MU 1651	ķ		4	or check the Yellow Pages in

any stamping center in the United States or Canada for distributors stacking PRODUCTO.



Encircle No. 292 on Card, Opposite Page 65



Accuracy and Quality Beyond Comparison!

LEAD SCREW TAPPER

This new lead screw tapper performs with miraculous accuracy . . . maintains uniform precision threads easily . . . all the time! And . . . with experienced or inexperienced operators . . . it makes no difference! Here's the secret: the tap is fed gently, easily, automatically without any pressure on the tap itself—it's completely controlled by the lead screw which guides the tap steadily, quickly, accurately—without variation—ever! Tests have shown it to produce parts with 100% inspection—100% acceptable parts—without rejects.

Check these facts on this amazing unit!

- Consistently produces uniform threads in any pitch from 20 to 80!
- Finger tip "trigger arm" travels only 1/4" on up or down stroke.
- Positive depth stop automatically disengages clutch at top and bottom of stroke without overrun; holds uniform depth to within .005".
- Tap capacity 0" to 1/4" in soft material—0" to 3/16" in steel.
- Entire lead screw assembly can be replaced in seconds for varying pitches.
- Lead screw travel 1-3/16". Will hold a class 3 fit with ease.
- Almost all parts spoilage completely eliminated; reduces fixture costs.
- Has famed Procunier cork faced friction clutch and exclusive tru-grip tap holder.
- Can be air operated for greater speed and convenience.

Write for FREE Brochure giving full details and specifications on this unique tapper. Illustrates the many outstanding features which make it a "must" for industrial users. Write today—now

PROCUNIER Safety Chuck Co.

14 S. Clinton Street . Chicago 6; Illinois

New Tru-grip Tap Holder

is lighter, smaller in diameter. It affords easier tapping close to walls er shoulders, climinates "chewed" tap shanks.

there is a

KELLER POWER HACK SAW

to meet your requirements for lower cutting costs!



No matter what you cut ... Bars ... Rounds ... or Pipes ...

you can do it fast, accurately, and economically with Keller Power Hack Saws. Ten popular models meet every power hack saw requirement. You'll find features which guarantee long life and genuine satisfaction. Thousands of Kellers are in daily use in plants all over the world.





TEN MODELS FIVE CAPACITIES

Five capacities 4"x4"...5"x5"...634"x634"...7"x7"... and 9"x9"... for your needs. Write for the new Catalog on Keller Power Hack Saws and low prices.





SALES SERVICE MACHINE TOOL CO.

2357 University Ave.

St. Paul 14, Minn.



POWER HACK SAWS

Encircle No. 294 on Card, Opposite Page 65

Your Best Buy in a

SURFACE GRINDER (

BOYAR-SCHULTZ 6x12



the latest development in a 6 x 12 Surface Grinder.

ACCURACY SECOND TO NONE

- comparable to that of larger, more costly machines.

STURDINESS—maintains close tolerance precision over long production runs.

New Hydraulic valve, designed and developed by Boyar-Schultz engineers, affords perfect reciprocating longitudinal movement.

*Including stand—other accessories optional at additional cost.



COMPANY_____ADDRESS_____

CITY____ZONE_

STATE

BOYAK - SCHULTZ CORPORATION



Plastic Low Cost Tooling

Dies · · · Drill, Welding, and Assembly Jigs



Vulcan, keeping pace with modern tooling, can recommend plastic tooling for medium production on numerous tool programs.

Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

Contours and odd shapes are cast or laminated to suit individual tools, saving expensive machine and hand finishing operations.

Plastic tools, built in a matter of days instead of weeks, lower your tool costs for those medium production runs.

Our actual production figures prove plastic has a definite place in modern production.



Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

Our engineering staff will recommend the correct plastic material and advise if parts of your tooling program should be in plastic.

Send a part print and your production requirements for auotation and recommendations.



Major Vulcan Services . . Engineering, Processing, Designing and Building . . Special Tools . . Dies . . Special Acohem . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO....PLASTIC TOOL DIVISION

727 Highland Avenue

Dayton, Ohio

For Quick and Easy Cutting

SIMONDS

HIGH SPEED

10"-18T

SIMONDS "Red End" HACKSAW RI ANFS



All honds are top hands with a "Red End" Blade.

For Fast Service from Complete Stocks

SIMONDS Industrial Supply

Considien Factory Breaches in Besten, Chicago, San Principsio del Permine, Oregon Considien Factory in Mentrevia, Cue. Sprands Dispinions: Simondis Steel Mill, Lockport, N. Y. Simondis Abresive Co., Philo., Po., and Arvide, Que., Canada

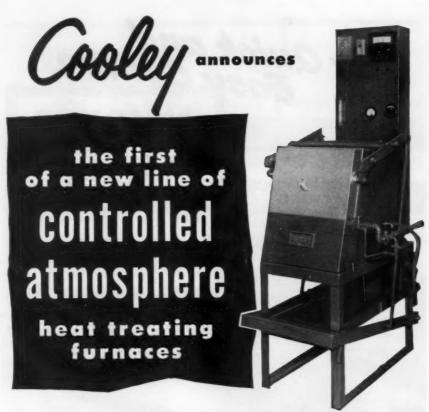
There is a difference in hacksaw blades. A quality blade cuts faster, easier, straighter . . . gives more cuts per blade. That's why those who know, insist on Simonds "Red End" — the blade that's famous for quality.

"Red End" — the blade that's famous for quality.

Tough electric furnace steel, accurately milled and precision set teeth, scientific heat treatment and close production control are combined in these blades to give sharper, faster, longer lasting cut-ability to every blade. What's more, you have a choice of three types of blades for lowest cost and best results on different jobs: STANDARD STEEL for general purposes use; HIGH SPEED MOLYBDENUM for longer wear and greater resistance to breakage; HIGH SPEED TUNGSTEN for best results in cutting tough alloy steels. All blades come in 10 and 12 inch-lengths and in standard tooth sizes with a choice of Hard Edge or All Hard. Specify "Red End" and get more for your hacksaw dollar.

SIMONDS SAW AND STEEL CO.

Encircle No. 297 on Gard, Opposite Page 65



for clean hardening without decarburization

Now, for the first time, atmosphere protection in small furnaces is available with a reasonable investment and low operating costs. This new Cooley GA-3 electric furnace has been especially designed for tool rooms and small production. As a package unit it includes a fully wired temperature control panel and atmosphere generating unit. The furnace incorporates a sealed alloy retort with tightly closed door, automatic gas curtain and foot operated door

mechanism.

The atmosphere is generated by cracking alcohol and water of proportions pre-determined to suit the application. Steel may be clean hardened without decarburization, or may be carburized. This patented process is simple in design and operation, and requires little adjustment.

Investigate the possibilities of this new furnace for your work. Write or wire for catalog.

COOLEY ELECTRIC MANUFACTURING CORPORATION

36 SHELBY STREET . INDIANAPOLIS 7, INDIANA

Encircle No. 298 on Card, Opposite Page 65
MACHINE and TOOL BLUE BOOK

No. 50C ELECTRIC SCREW DRIVER MILLERS FALLS

- TWICE THE DRIVING POWER
- . GREATER CAPACITY wood screws up to #12x11/2" machine screws to 1/4"
- MUCH LONGER BRUSH LIFE
- . BUILT-IN REVERSING SWITCH
- INTERCHANGEABLE SWITCH LEVERS (Paddle or Butterfly)

Plus

the famous, super-sensitive ADJUSTOMATIC® CLUTCH



Butterfly Switch





Paddle Switch

For years, the Millers Falls No. 50 has been the most successful of all electric screw drivers. Now - in this remarkable new Model 50C - it's even better - more powerful, more versatile than ever before.

In fact, its range of uses is so wide that it entirely supersedes and replaces all four of the previous No. 50 and No. 52 Series screw drivers.

Whether you are assembling delicate eyeglass frames with tiny optical screws or driving 11/2" #12 screws in hardwood, you can count on the new 50C for outstanding performance. It's fast, powerful and dependable - and the patented "Adjustomatic" Clutch assures velvet smooth operation with precision torque control month after month.



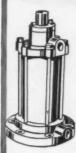
FREE DEMONSTRATION

Let us show you how the new No. 50C Screw Driver cuts assembly time - gives better, more uniform work at lower cost. Write, too, for literature on the 50C and on Millers Falls wide line of other high-performance electric tools.

MILLERS FALLS COMPANY Dept. MT-7, Greenfield, Mass.

Encircle No. 299 on Card, Opposite Page 65

Logan Hydraulic Cylinders



750 SERIES NONROTATING TYPE 7 STANDARD MOUNTINGS

Eight standard sizes from 2" to 8" diameter bore. Maximum operating pressure 750 psi.

Covers chrome nickel cast iron. Large outlet and inlet for rapid action. Bronze packing glands. Steel packing gland caps. Hydraulic-type V-ring packing. Honed, seamless steel tube. Step cut-type piston rings. Piston chrome nickel cast iron. Multiple pipe connections for convenient installation.

Logan 750 Series and Rotating Hydraulic Cylinders are the result of nearly forty years' experience in the development and manufacture of hydraulic equipment. They are today providing high operating efficiency in thousands of plants.

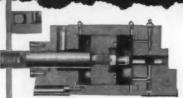


Check the many outstanding features of the Logan hydraulic double-acting, monrotatingtype cylinder an indicated in the above cross-section. They assure continuous sertic under most server operating conditions.

ROTATING "HR" TYPE

Seven standard sizes from 3" to 14" diameter bore. Maximum operating pressure 500 psi.

ROTOCAST SERIES ... 7 STANDARD MOUNTINGS



Sizes from 2" to 8" bore; any length stroke up to 8 feet as standard. Four piston rod end types. Operating pressures to 1500 psi.

Note features as shown in crosssection. Ground and polished alloy steel piston rod. Bronze packing gland bushing. Self-adjusting hydraulic packing. Synthetic

seal rings (see enlargement). Close-fitting pilot for centering piston on piston ring. Nut securely locked to prevent loosening of piston. Close-grained cast piston of ample length to provide necessary bearing and strength. Cushion check valve of ample size to prevent quick start of piston travel. Optional ports. Adjustable cushion speed valve. Automotive-type piston rings. Air vent valves. Centrifugally cast iron cylinder tube retains smooth, accurate bore. Large ports for unrestricted oil flow. There are no hydraulic cylinders more dependable than Logan Rotocast.



Lot Logan engineers help you design your Air and Hydraulic Circuits.

National Tool Builders Assn., National Fluid Power Assn.

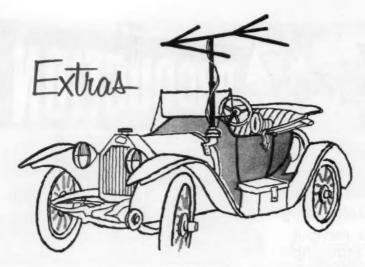
LOGAN MANUFACTURES 7023 STANDARD CATALOGED ITEMS

FREE CATALOG ON REQUEST

AIR CONTROL VALVES, Car. 1864 - AIR CHUCKS, Car. 764 - AIR CYLINDERS, Car. 1863 - AIR. DRAULIC CYLINDERS, Car. 186-AIR and HYDRAULIC PRESSES, Car. 51 - COLLET GRIP TUBE FITTINGS, Car. 206-5 - HYDRAULIC CONTROL VALVES, Car. 206-4 HYDRAULIC CYLINDERS, Car. 2061 - HYDRAULIC POWER UNITS, Car. 2061 - SURE-FLOW COOLANT PUMPS, Car. 42

LOGANSPORT MACHINE CO., INC., 803 CENTER AVE., LOGANSPORT, IND.

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... are standard equipment at AMERICAN



- * Double ground lead for easy pressing into the jig.
- * Radius into the hole to prevent tool hang-up, wear and breakage.
- * Two way undercut under the head to insure squareness to the jig.
- * 100% concentricity inspection.
- * Internal ground holes to insure straightness.
- * Original 3-D ordering method eliminating confusing code numbers.
- * Patented bushings for plastic tooling.
- * Complete local stocks.

USE AMERICAN-PIONEERS IN PRODUCING DRILL JIG BUSHINGS WITH EXTRA PEATURES AS STANDARD EQUIPMENT.



Send today for the newest free Catalogs showing complete line. American

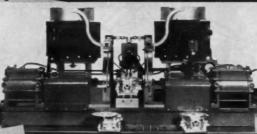
DRILL BUSHING CO. 5107 PACIFIC BOULEVARD LOS ANGELES 58, CALIFORNIA

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4 to 1 Time Saving! 4 to 1 Cost Reduction! 4 to 1 Labor Saving!

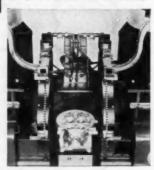
OVER PREVIOUS Hand PRODUCTION! 4 BRONZE BUSHINGS

INSERTED INTO 4 BARREL CARBURETOR CASTINGS-



VIBRATORY BOWL FEEDERS

The bushings are fed from two DPS Bowl Feeders and transferred into four opposed tracks, bringing the bushings into alignment . . . Operator simply places the castings over locating pins in the fixture and cycles the machine by means of a foot switch. Air actuated rams come forward, pick up two bushings on each side and press them to the proper depth with one stroke, previously an individual hand operation. Machine cycle, two seconds.



How about YOUR Assembling Method?

DPS has solved this and thousands of other bottlenecks through the use of their POWER SCREWDRIVERS, PARTS FEEDERS and SPECIAL MACHINES. We can do the same for you. Tell us your problem.

POWER SCREWDRIVE

FORT ST.

DETROIT 16. MICH.

Encircle No. 302 on Card, Opposite Page 65
MACHINE and TOOL BLUE BOOK



Two really new and important facts should be noted in this announcement by Van Keuren: the closer tolerance of \pm .000008" on VK Microgages, and the 81-block combination of %" diameter longer-wear gages . . now available for the first time.

These fine quality precision gage blocks by Van Keuren are products of the same machine-lapping and inspection techniques as Van Keuren Rectangular and Solid Square gage blocks. Size tolerance as already noted is guaranteed, as well as a maximum surface roughness of 1 RMS. Because their round shape provides greater wear surface, Van Keuren Microgages

can be depended on for longer life and lower cost. Their closer tolerance has been particularly developed to meet today's demands for more exacting precision in shop work.

In addition to the new 81-block closer tolerance set featured here, Van Keuren offers 15 other standard sets of Microgages; also Solid Square type sets of gage blocks in .000004" accuracy and Rectangular type sets in .000004" and .000008" accuracy. For further information address:

The Van Keuren Co., 177 Waltham St., Watertown, Mass.

"Quality in Millionths"



THE Van Keuren co.

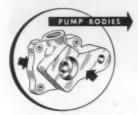
177 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment - Light Wave Micrometers - Gage Blocks - Taper Insert Plug Gages - Wire Type Plug Gages -Measuring Wires - Thread Measuring Wires - Gear Measuring System - Shop Triangles - Carboley Cemented Carbide Plug Gages - Carboley Comented Carbide Measuring Wires -Chrome Carbide Taper Insert Plug Gages

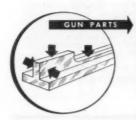


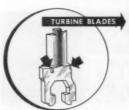
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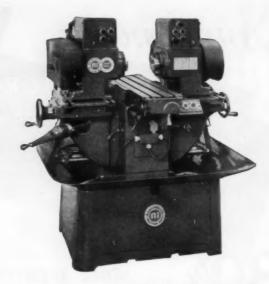












on the NEW Nichols TWIN MILL

The TWIN MILL cuts milling costs in half on many jobs. It handles TWO milling operations at a time, yet requires but ONE fixture and ONE operator. Designed for the class of work usually assigned to Hand Millers or light Automatic Production Millers, the Twin Mill's speed, accuracy, and exceptional flexibility add up to increased output at lower cost. New Spindle Retraction automatically withdraws cutters at the end of each cutting stroke. New Spindle Brakes act instantly after cycle is completed. The Two Milling Heads are independent units with individual motor drives, quickly adjusted UP or DOWN, IN or OUT, or OFF-SET longitudinally. Machine handles short run or long run work economically. Automatic table cycle and entire machine push-button controlled. Write for details.

CONDENSED SPECIFICATIONS

Table, working surface	
Table, travel—cutting stroke	11%"
Motors	(two) 1 HP
Maximum height center of spindle above table	1134"
Maximum offset of spindles (horizontal)	81/2"
Maximum distance between spindle noses (across table)	
Floor space required	
Spindle Speeds [15]	from 55 to 2050 R.P.M.

Manufactured by W. H. Nichols Co., 48-H Woord Ave., Waltham 54, Mass.

Have you seen the new Nichols' movie, "The Miller That Uses Its Head"? It's available for shawing in your plant.



Also evoilable are NICHOLS Hand Millers, NICHOLS two-spindle millers with identical or apposed spindles, and with or without pneumatic feed.

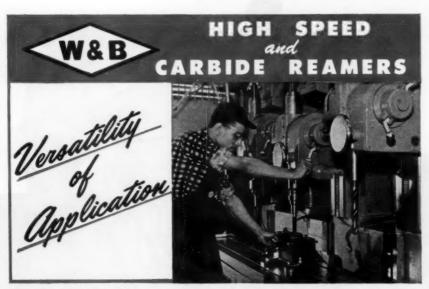
Please address inquiries to

NICHOLS-MORRIS CORPORATION 76-6 MAMARONECK AVE.

Dealers in Principal Cities
WHITE PLAIMS, N. Y.

Encircle No. 304 on Card, Opposite Page 65

MACHINE and TOOL BLUE BOOK



Modern manufacturing operations are constantly demanding faster reaming, better finish of holes, longer reamer life and more holes per grind on an ever increasing variety of materials. Whitman & Barnes reamers are designed to provide the answers to these multi-purpose demands. For, regardless of application, there is either a high speed or carbide W & B reamer of the exact type required to better meet your reaming problem.

Also, W & B reamers are equally effective in reducing production costs and producing better results when used with either automatic or hand operated equipment. For instance, the above illustration shows a worker in a large aircraft plant efficiently reaming aluminum forgings by hand operating a press equipped with W & B reamers. On other parts in this same plant automatic multi-spindle machines also use W & B reamers to obtain best possible results. Are you reaming tough abrasive materials? Do you want increased production and better finishes? There is a W & B reamer for your every need.

"Makers of Fine Tools Since 1848"

Please send me additional information—

NAME

COMPANY

ADDRESS

CITY

ZONE STATE

W&B

Call

Your W&B distributor

for best service
and highest quality

He can save you money
by supplying from his
stock . . . what you need
when you need it!

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"Here's why GISHOLT insists upon

the HEAVIEST CASTINGS!"

Look at them...castings for the heaviest saddle type turret lathes in the business! Look at all the angles:

First, note how the headstock is cast integrally with the bed for perfect spindle alignment...how cross supports give the most solid base for carriages, tools and slides...how extra-heavy webbing gives the headstock the ruggedness to support powerful gear train members.

Remember, too, that cast iron absorbs vibration. The heavier the better! And Gisholt controls the quality of the finest nickel semi-steel in its own foundry.



The Gisbolt 5L Saddle Type Turret Lathe has a net weight of 22,500 lb. without equipment.

What does it mean to you? You can load up your Gisholts with carbides and really turn out the chips! You've got the strength, the rigidity and the freedom from vibration to take all the speed you can get from today's carbides—with the heaviest feeds—and still have the safety margin to take care of tomorrow's tool bit developments.

G SACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are wolcomed here.



TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

THE CORRECT BLANCHARD WHEEL GETS YOUR NOSE OFF THE GRINDSTONE



BLANCHARD SURFACE GRINDERS give you peak production and economy when maintenance is performed on schedule, and when you use the best wheel for each job.

For more than 25 years, Blanchard has been making wheels that do their jobs in less time, with less trouble and cost... whether the work is tough as copper or fragile as glass... whether it requires heavy roughing cuts or clean-up cuts with flatness of .000005" to .000010" and finish of 1 to 3 micro-inches.

Our quarter century of experience has proven that Blanchard grinders perform best with Blanchard wheels...on every job!

SEND FOR OUR NEW, FREE FOLDER on Blanchard cylinder, sectored and segment wheels in silicate, resinoid

and vitrified bonds.



	THE	BLAN	C	HARD	M	ACI	HINE	CC	٥.	
64	STATE	STREET		CAMBRID	GE	39,	MASS.,	U.	5.	A.

Gentlemen:

- Please send new Blanchard Wheel and Segment folder.
 - Please send The Art of Blanchard Surface Grinding.

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TITLE

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STREET.

CITY

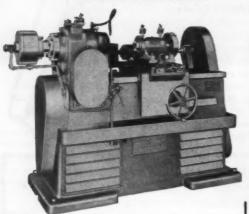
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Encircle No. 307 on Card, Opposite Page 65

HOB THREADING:

- NON FERROUS METALS
- ... YOU NEED HIGH SPEED!
- HEAT TREATED MATERIALS
- ... YOU NEED LOW SPEED!
- VERY SHORT RUNS
- YOU NEED QUICK CHANGEOVERS!

ONLY THE COULTER "H1" GIVES ALL THREE!



EXTRA For Brass, Aluminum and Steel.
The "H1" makes provision for a separate motor to give the cutter and work spindle a larger range of speeds and feeds for threading these materials.

Machine Tool BUILDERS Since 1896

Yes sir, the COULTER "H1" Hob Thread Milling Machine is the only completely automatic machine that has such outstanding exclusive features for producing precision internal and external right-hand and left-hand threads - ON A PRODUCTION BASIS!

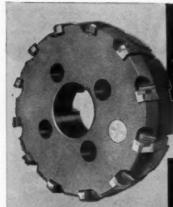
In addition, it's (a) fully AUTOMATIC, (b) works equally well with universal or air operated chucks, or, special fixtures, (c) has work spindle with an extra large hole, (d) work can be inserted from face to rear end, (e) has pick-off gears and adjustable sheave drive.

It's the machine for you!

Send for complete information on the "H1" and other Coulter Automatic Threading Machines - no obligation.

oulter Machine Co. Bridgeport 5, Conn.

Encircle No. 308 on Card, Opposite Page 65
MACHINE and TOOL BLUE BOOK



Where heavy cuts are the rule, Kroslok performs long and profitably.

KROSLOK MILLING

GROUP IMPORTANT CONCEPTS FOR

TOP FEEDS AND SPEEDS

UGGER



Production milling requires "tops" in production tools.

Production milling realizes a new high with Kroslok face milling cutters and shell end mills. Simplicity of design (only three members), extreme ruggedness and rigidity, merit your thorough investigation. Kroslok is available in general purpose and heavy duty types for ferrous or non-ferrous metals, with both fine tooth and extra fine tooth variations, in diameters from 3" through 24". May we suit Kroslok's advantages to your job?

MOTCH & MERRYWEATHER MACHINERY CO.

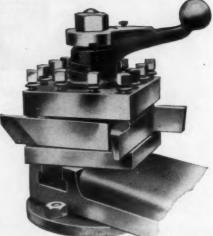
CUTTING TOOL MANUFACTURING DIVISION CLEVELAND 17, OHIO

Stocking Dealers in All Industrial Centers

TRIPLE-CHIP CIRCULAR SEGMENTAL AND SOLID CUT-OFF BLADES . TRIPLE-CHIP SLITTING SAWS . TRIPLE C GRINDING COOLANT . TRIPLE-CHIP SOLUBLE OIL



TOOL POSTS



permit successive tools to be swung

into position

quickly

indexed

accurately

and locked

rigidly

Endorsed by All Well Known Lathe Manufacturers

Multiple tool jobs become continuous when you use McCrosky Turret Tool Posts. They permit engine lathes to handle — efficiently and economically — a wide variety of work that otherwise would require a turret lathe or specialized machine. Ruggedly built. 12 indexing positions. Mount in the T-slot of the compound rest or bolt circle of the main slide. Unsurpassed for performance and satisfaction. Write today for Bulletin No. 18-T. It gives full details.



CORPORATION

Engineering and Sales Representatives in the Principal Cities

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REPLACE with RED-E — and be SURE!

Phone your nearest RED-E Industrial Distributor today! Literature Available, No Obligation. DISTRIBUTORSHIP

CENTER Specialists Since 1908

READY TOOL COMPANY

550B Iranistan Ave.

Bridgeport 5, Conn.

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"It takes two to make a bargain"

How right!

Entirele No. 312 on Card, Opposite Page 65

assured of a bargain . . . the just-right selection from alternative materials, offered without bias from a occupies the unique position of supplying vom see single source of complete shop tooling.

Cold heading operations, for example, illustrate the point. Either steel or carbide, or both, may be used successfully. But one may have an advantage over the other because of the requirements of the job ... such factors as quantity of product, geometric design, desired finish, material used and tolerances required. We have both steel and carbide. We can recommend the exactly right one, or both, if indicated! Yes, for cold heading "it takes two to make a bargain" . . . Firth Sterling C.H.Q. Steel and Firthaloy Carbide Nibs.

C.H.Q. COLD HEADING QUALITY STEEL

- Controlled hardenability by size
- Controlled carbon content by size
 - Special cold heading inspection for good centers
- Safety in heat treatment
- Superior toughness and fatigue resistance

FIRTHALOY CARBIDE NIBS

- Controlled quality
- Made specifically for cold heading applications
- Toughest grade of sintered carbide Maximum impact and fatigue resistance
- Good machinability

Your Firth Sterling representative will recommend the best grade of steel or carbide for your applications and product requirements.

Firth Sterling

-INC-

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD*
HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

PRODUCTS OF FIRTH STERLING METALLURGY
High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
High Temperature Cermets

R-303

CALL YOUR FIRTH STERLING DISTRICT OFFICE OR DISTRIBUTOR. ASK MR. TOOLEY.

MORE POWER at the Spindle Nose

The greater work capacity of 10", 11" and 13" Sheldon Precision Lathes comes in part from their extra power. Compared to other lathes of similar swing and price, Sheldon Lathes are built to take larger motors. Sheldon Motor drives are better engineered and better built. In place of a single ordinary V-belt to drive the lathe spindle, these Lathes have twin, Neoprene, cog V-belts (each capable of delivering 40% more power than an ordinary V-belt).

The greater wrap-around of Sheldon's twin cog V-belts not only delivers more power at the spindle nose—permitting heavier cuts, they also eliminate slippage at the spindle—increase accuracy of work.

Made of oil, heat and static resistant Neoprene, Sheldon's Spindle belts have a longer

Spindle belts have a longer life expectancy than other belts of similar type.



Type E



UM56P-with 4-speed external lever shift type U, underneath Motor Drive in heavy cast iron Pedestal base with storage space in tailstock leg. \$1434.00 F.O.B. Chicago, less



EM56B-with 4-speed Type E. Underneath Motor Drive in Cabinet base. \$1467.00 F. O. B. Chicago, less electrical equipment.



Write for New G-55 Catalog

SHELDON MACHINE CO., INC. **CHICAGO 41, ILLINOIS** 4242 N. KNOX AVE.

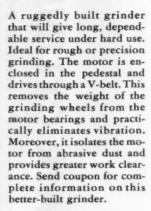
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MACHINE and TOOL BLUE BOOK

SOUTH BEND

PEDESTAL

GRINDER



SPECIFICATIONS

Wheel Size: 8" dia. (1/2 h.p. motor), 10" dia. (3/4 h.p. motor).

Spindle: Approx. speed 2450 r.p.m. Sealed ball bearings.

Motor: Standard 2875 r.p.m. 50 cycle or 3450 r.p.m. 60 cycle. Also D.C.

Over-all Dimensions: $49\frac{1}{2}$ high, 18" wide, $20\frac{1}{2}$ " deep (10" Grinder $\frac{1}{2}$ " wider).

8"—\$245. 10"—\$248. each less motor and remote control equipment. Convenient time payment terms: Only 314% annual interest on original unpaid balance.

ADJUSTABLE ILLUMINATION ADJUSTABLE ADJUSTABLE SPARK U-SHAPED HEAVY V-BELT WHEEL DRIVE GUARDS PROTECTED MOTOR

OUR PE	red with or RICES ARE by were back	LOWER
WASES UP		49%
'41 '88	41 35	41 55
are still ri	closely tied to sing. Buy nov its necessitate	w before in-

SEND INFORMAT	ION CHECKED:				
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City			State		
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Building Better Tools Since 1906 . SOUTH BEND LATHE . South Bend 22, Indiana

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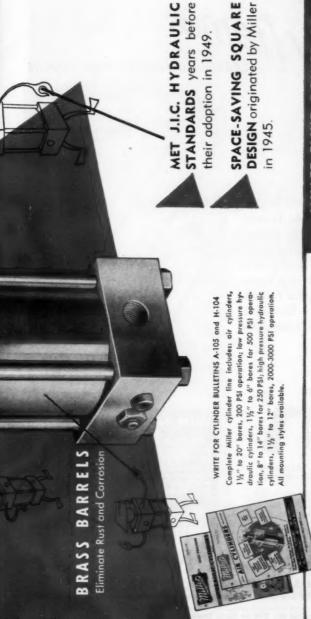
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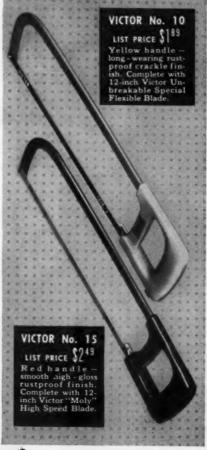
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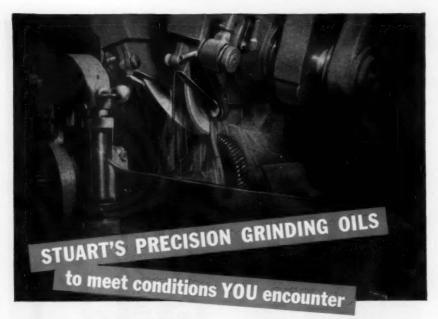




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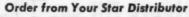
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The Portland Heavy Duty Milling Head can be used to convert your planer to a modern high-production planer type milling machine.

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Encircle No. 326 on Card, Opposite Page 65 MACHINE and TOOL BLUE BOOK



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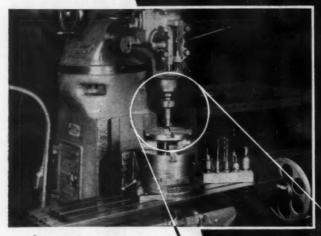
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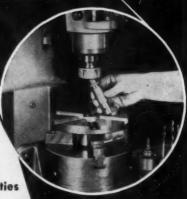
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Featured in this issue

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Special Purpose vs. General Purpose Machines, by Perrin G. March, III, president, The Cincinnati Shaper Co., Cincinnati, O. The author deals with a problem which is puzzling many production engineers:

Should we buy a special purpose machine to do certain work; or should we do it on a general purpose machine. Page 203

Time Study . . . part 10, by Harold R. Nissley. This is the tenth part of a series on time study, which began in August. The present article deals with Incentive and Job Design. Mr. Nissley outlines how to determine an operator's fair day's work for a fair day's pay. He gives examples of the questions raised by both union and management officials and also provides case history settlements to the problem.



one set-up saves 30%

> Photos courtesy of the Kelman Electric & Mig. Company, Los Angeles, California.

Boring, facing, and high speed drilling with one set-up cut the floor to floor time about one-third on this job.

The Kelman Electric & Mfg. Company say their Cincinnati Super Service Radial Drill "handles easily, is very accurate and versatile."

They are facing 6" diameters; drilling for ½" bottom tap, and tapping with a ½" bottom tap on this job.

The part being processed is a Bronze Top Casting.

Cincinnati Super Service Radial Drills are profit makers in this shop, and they could be in yours.

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MACHINE and TOOL BLUE BOOK

AS THE Editor SEES IT

Work-A-Day Research

When we think of research we visualize a huge, sprawling, modern building bulging with such special and costly machines as well determine the weight of the moon if that lovely orb were made of Swiss cheese. As a matter of fact, the equipment will even weigh the holes in the cheese.

If you want to make real diamonds or develop an A-bomb you will want a goodly-sized buliding, costly equipment and trained scientists. But such desires are beyond the commercial interests of the average manufacturer who often feels that research belongs to the big and the wealthy. And yet research need not involve mortgaging the plant and facilities; you don't have to develop a process of weighing the holes in a cheese. Research can be applied on a practical work-a-day level. There just isn't enough practical research work being done by the average manufacturer. And we're mindful of the giantlike strides taken in the field of research compared to the snail's pace of 25 years ago.

There are too many manufacturers selling the same product year after year without making even a faltering attempt at improvements. They only change when forced to by a competitor, and then they copy.

There should be more research by the average manufacturer regarding the behavior of his equipment under varying conditions; more work in developing new applications. This is one aspect of research that's practical and worthwhile.

We have often asked manufacturers, "Have you ever tried such and such on your equipment?" The answer is usually the same, "Can't tell. Never tried it."

Research doesn't necessarily have to be concerned with abstract theory; it can be brought to a level where results will immediately be reflected in better work and more applications for the user.

It would appear to be merely good common sense that such simple research be carried on by manufacturers. And because it is not some might wonder about the common sense of the manufacturer. Luckily for all of us there are many companies whose practical research work keeps wheels turning and motors humming. Incidentally, it also makes the cash register ring.

William 7. Schlicher



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Thirty-six pages of valuable metal working information for anyone with bending problems. It's a "how to" book covering many materials and shapes. No charge—write today. pronounced die-ack-ro



O'NEIL-IRWIN MFG. CO., 314 8th Ave., Lake City, Minn. Encircle No. 330 on Card, Opposite Page 65

very truly!

Letters to the Editor

Manufacturer's Literature

I want to thank you for your attention in passing along my requests for literature to BLUE BOOK advertisers. I am receiving the literature and it is of great interest.

courteous, however, in some instances where they have representatives in this country, they sent my letters to their agents with the request that the agent forward the literature. In 90 out of 100 cases the representatives do not send any or send abridged leaflets that are valueless for a technical man who requires complete data on machines and tools . . . this is detrimental to the manufacturer. I recommend that U.S. manufacturers should send the specified literature directly to the inquirer.

Cesar J. Serra, M. E., Technical Consultor, Gropper, S. A.

Pertable Air Tools

In a recent issue of Blue Book you ran an article entitled "Dollar Wisdom of Using Portable Air Tools."

I would very much appreciate a reprint of this article mailed to my attention....

Willam J. Ferrick, Carry-Pack Co. Ltd.

Tear sheets sent.

Tooling Practices

The writer would like to obtain a copy of the article, "New Studies Show Errors in Many Present Tooling Practices," by Clifford T. Bower, which was the feature article in the October issue of Blue Book.

If you have copies available, kindly send at your earliest convenience.

Silas Wellman, Prod. Engineering, Aircraft Corp.

Tear sheets sent.

Special Reports

For some time now your magazine has been publishing special reports of metal working equipment. We are wondering if this material is available, and if so what are the prices?

J. G. Allen, C. F. Bulotti Machinery Co.

The special reports on standard machine tools, as published in monthly issues of Machine & Tool Blue Book, are available in two volumes entitled "American Built Machine Tools, Their Uses, Specifications and Manufacturers." Volume 1 contains reports on automatic screw machines, turret lathes, chucking, hand screw machines, broaching machines, milling machines, honing, lapping, superfinishing, shapers, slotters, keyseaters, planers, lathes, thread rolling, power press brakes. The price is \$3.00



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and micrometer gauge which is operated by a handle at front of press just below top of bed.





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Volume 2 contains reports on drilling, gear making, boring, and grinding machines, and the MAPI replacement form. ula. Price is \$4.50

Milling Operations

. . . please advise as to how I may obtain a copy of the article "How to select the proper S.F.M. in milling operations," which appeared in the Sept. 1953 issue of Machine and Tool Blue Book.

Howard Albright Rockford, Ill.

Tear sheets sent.

Time Study

Your article "Time Study-Part 7" in the March issue of Machine and Tool Blue Book is very interesting. I am engaged in developing a time study program for our plant and would appreciate . . . tear sheets on the complete series.

Albert J. Klaus, P.E., Time Study Supervisor Airco Equipment Mfg. Div.

Please send tear sheets of Mr. H. A. Nissley's article on Time Study, August

General Electric Co.

... in the August, 1954 issue you began an important study of Time Study by Harold Nissley. I was unable to locate the other issues to read the succeeding articles. I would appreciate if you could help me get them as it would help me understand not only the one side of the very important problem.

Frank J. Nast Massapequa, N.Y.

In the March issue . . . you have an article by Harold R. Nissley entitled, Time Study, Part 8. In November, 1954. reprints of Mr. Nissley's first five articles were available. We would like to obtain six each of the succeeding reprints. . . .

These articles are very good. . . . L. C. Olson, Marlin-Rockwell Corp.

. . . like to commend you on the fine series of articles written by Harold Nissley.

It would be appreciated if you would send me a copy of each of the articles that have appeared . . .

Andrew P. Slivka,
HPL Mfg. Co.

We reprinted the first five parts of this series and would like to send you a copy of these, but the demand has been so great that our supply is now completely exhausted. However, the entire series will be published in booklet form sometime during May or June at an approximate cost of 75 cents. If you should like to obtain a copy later we shall be happy to send one if you will drop us a line.

A local person has requested our firm to determine the manufactures of wire forming machinery for the specific purpose of forming coat hangers . . .

W. E. Wyatt, C. G. Wyatt Machy. Co.

Information furnished.

Information Please

We would greatly appreciate your furnishing us with the names and addresses of manufacturers of Tracing, and/Or following attachments.

Jacob Freidus, Aaron Machy. Co.

For one of our good customers we are looking for the manufacturer of a special tool which can be mounted on a lathe, which we believe is called the Roto-Head. We understand this tool has 8 equally spaced "T" slots in which the cutting tool moves.

H. P. Wichelhaus, vice-president, Apex Machine Tool Supply, Inc.

... please send information concerning companies which manufacture plug and ring gage blanks.

Gordon R. Tillema, Westfield, Mass.

We would like to locate a concern who makes replacement lead screws, with nuts for lathes, used on cross slide and compound rest on lathe carriage, they could ce semi-finished. Can you help me . . .

L. L. Adams Adams Machy.

Production Tapping

Would you be kind enough to send me a reprint of "Trends and New Developments in Production Tapping" which was published in the July issue of MACHINE and TOOL BLUE BOOK.

G. Dexter Providence, R.I.

Copies of Harry Conn's splendid article on tapping sent to reader Dexter.



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If its a Flat Surface to Grind There's a Mattison to Grind th

• Mattison now is in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced fixture engineers are available to give you best production efficiency with Mattison Machines.

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230 surfaces of rest iron compression heads per bour, removing 1/32' stock with Martisse.



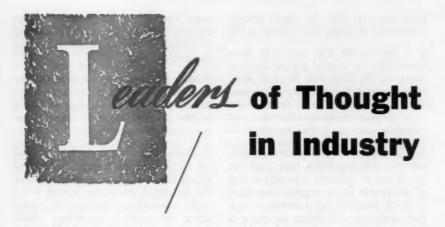
900 connecting rods per hour, using 40 station flature to finish grand crank and wrist pin end of assembled rod with Mattison No. 72 Grander



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MACHINE WORKS

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Interview with James F. Lincoln, president, Lincoln Electric Company

Q. Mr. Lincoln, as an industrialist and an author, you have advocated a program of incentive management. Briefly, would you outline your program, and give us some of its chief advantages, both to industry and to labor?

A. The incentive program is to reward the people in the organization in direct proportion to their contribution to the success of the company, that is done on a yearly basis. It has been successful in reducing our labor costs very materially, so that at the present time our labor cost per unit of production has been reduced by more than 92% compared to what it was 21 years ago when we started this incentive program.

Q. Can you give some of the reasons why you think industry in general is slow to adopt this program? And what are the chief obstacles from having industry accept it at this time?

A. Probably because it is different, probably because it will upset a great many

of their present habits, probably because of the fact that people in general hesitate to accept any new ideas. Habit is pretty much of a ruling reaction in most people.

Industry has never done it that way before. Industrial leaders have a good deal of difficulty in perhaps thinking of the man in the shop as being a partner in the activity rather than just merely a clock number. After all, the man in the shop is the most skillful man on the job he is on. He is very much more skilled on that job than is the boss.

Q. Do you think your program will eventually be approved by both labor and management in general?

A. It is bound to be because it will result in such tremendous reduction in cost that no industry can possibly get along without it. Labor, so called, will also want it because of the very much greater reward that they will

have from it, plus the much greater satisfaction in doing that kind of a job.

Q. I understand that you have been responsible for several unique achievements in the industrial business management field. I would appreciate your explaining the good labor relations enjoyed in your company which have resulted in your strike-free record.

A. The fundamental difference, I think, between our condition here and the conditions in industry generally is that all the people in the organization want to work together for a common end, that common end being to make a better and better product to be sold at a lower and lower price. That program has been very successful over the years because our product today sells for less than it did 21 years ago. I think you will have a good deal of difficulty in finding any other manufactured product which is not several times as costly as it was at that time. Because of the very great steps forward we have made in the efficiency of production we have been able continually to sell the product for less than we did when we started the program 21 years ago.

O. I also understand your company carries on an extensive educational program to teach welding techniques. Would you explain how you have set up this program?

A. We started a welding school in 1917 at the request of the Army who, at that time, wanted to have skilled operators for arc welding. There was very little welding done at that time. We have expanded welding training continuously since that time so that the people who come here will, when they leave, be able to do arc welding in an efficient

way. This is just as necessary to the successs of the application of welding as would be true of education for an engineering life.

O. Mr. Lincoln, I would like to hear your views in regard to automation. What effect do you think it will have in the general industrial employment picture in the near future?

A. Automation is merely a new word for an old activity. Every step forward which has been made in industry since the industrial revolution started is actually automation. Automation means doing by machine something which was done before by hand. Now the result that it will have in the future can well be indicated by the result that has occurred already. As the efficiency of production has increased, the proportion of people in industry has increased, not only the number in industry, but also the proportion of all workers is greater and greater as the efficiency of industry progresses.

Q. Do you feel that industry will be compelled to work a 30-hour week as a result of the automation influence?

A. That depends entirely upon the customer. He will determine how high a standard of living he wants. If it can be made in 30 hours then the 30-hour week will come, if he wants a higher standard of living than that, industry will go to 40 hours or any other number of hours which the customer wants it to work. It depends entirely on what standard of living the customer insists on.

O. How will this affect the future economy of the United States? Will it eventually put more money in the worker's pocket?

A. There isn't any doubt of it. Industry, ever since the beginning of the industrial revolution has rewarded the worker with higher and higher wages, not only in money wages, but in purchasing power. As a matter of fact there is no possibility of doing anything else. As the efficiency of industry increases, obviously the standard of living of everybody increases in the same proportion. Whether there are more dollars or not changing hands is beside the question because dollars, after all, are not necessarily purchasing power, they are merely pieces of paper.

Q. What do you think of present-day production costs? Are they too high, too low? And, if too high, how can they be lowered?

A. They are obviously too high and always will be too high compared to what is going to be done. Progress in the cost of production will go down as the efficiency of production goes up. That may not be in dollars, but it will be in hours per unit which, of course, is the only true measure.

Q. What is your company's replacement program as to machine tools?

A. We will always put any machine in that will justify its purchase. If its productivity will antiquate anything that we have here we will immediately throw the antiquated piece of apparatus out and purchase the new. It is not on the basis of a number of years, but on the basis of what can be accomplished by the new piece of apparatus compared to the old.

Q. From how many suppliers approximately do you buy components?

A. I would say thousands. I don't

know the actual number, but it would certainly be thousands.

Q. Would you know the value of equipment purchased last year?

A. I don't know what the summation would be. A great deal of this equipment is machinery that we made ourselves. Most of it is for something that can not be done with standard equipment. We make a tremendous amount of this type of machinery. At the present time I think we have a program which contemplates more than half a million dollars of equipment which we will make ourselves during this year. That is entirely outside of what we will purchase from suppliers on the outside.

O. How does your company determine whether to buy equipment or make it themselves? Do you have a policy or program covering this?

A. If we can buy what we want from the outside we will always buy it. There are many devices which we need of which there is no such thing on the market. Obviously, in those cases, we must make it ourselves.

Q. What products does Lincoln Electric make?

A. We make arc welding machinery and arc welding supplies such as electrode and the other supplies that go along with arc welding.

O. Mr. Lincoln, do you believe that big manufacturers are slowly pushing the small producers out of business?

A. Obviously not. All the companies which are in operation at the present time, without exception, started from nothing, or close to nothing. They will continue to grow as long as they are



James F. Lincoln

James Finney Lincoln is Chairman of the Board of The Lincoln Electric Company, Cleveland, Ohio, world's largest manufacturer of arc welding equipment. He has been the executive head of the company since 1914. He was elected President in 1929 and Chairman of the Board in 1954. He has achieved world-wide recognition as an industrial leader for the unique accomplishments of his organization.

James Lincoln was born May 14, 1883, on a farm near Painesville, Ohio. His father was a minister and the work of the farm soon fell on James as his two older brothers had left to undertake careers in electrical engineering. Hard work was a necessity of his family life. His mother, in addition to running the family as well as the farm, studied medicine and was one of the first women doctors in the State of Ohio. His large, 6-foot frame not only carried the burden of the farm work but also the janitor

work of a schoolhouse and church. For this he received \$74 a year. He walked the $3\frac{1}{2}$ miles to school every day in 35 minutes flat.

He worked his way to the Ohio State University where he followed the precedent of his brothers and studied electrical engineering. He played football for four years and was captain of the team in his senior year. During that year, the team never had its goal line crossed by its opponents. He fell a victim of a typhoid epidemic in the spring of his senior year which prevented his graduation. The University, however, awarded him a degree a number of years later.

Upon leaving school he joined his brother John, who had started The Lincoln Electric Company in 1895. The company was manufacturing electric motors but was on the verge of bankruptcy. He joined as the company's only salesman.

Lincoln entered business just as the age of electricity was dawning and many new developments were being introduced. One of these was the process of electric arc welding. He soon recognized its potential as a basic metal joining method for all metal-working industry. Seized with ambition to make this new technological achievement useful to the world, he began to urge the company to undertake the manufacture of welding equipment. His opportunity soon came.

In 1914 his brother John turned over the active management of the company to James, and he immediately began to infuse the organization with some of the enthusiasm he had for welding. He was 31. He still remembered the success that teamwork had brought on the football field and knew well the virtue of hard work. Putting these two together, teamwork and hard work, he began to evolve his ideas of management and through them create an organization devoted to the welding industry.

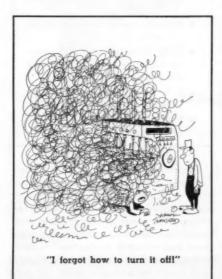
Mr. Lincoln has written two books on business management: LINCOLN'S INCENTIVE SYSTEM and INCENTIVE MANAGEMENT. The latter has sold over 55,000 copies. He has also spoken before groups all over the world discussing his philosophy.

the best in the field. New companies are starting out at the present time in larger numbers than ever before. A' certain number of them will come to the position where they will be dominant in the field. There were over a thousand automobile companies which

started originally. Of those we have three who are still very successful. All of them started from nothing, the ones who were best came to the top, those that were not, disappeared. That is what competition is and that is what inspires all progress. Q. How can these small fellows successfully compete against the large companies? Is there any formula?

A. All that is necessary for anybody is to build a better product to be sold at a lower price. Certainly, an individual starting from the ground can do that better than a large organization which is so large that it is clumsy. But the whole situation depends upon whether the company can make a better product and sell it at a lower price. Every better product is the product of individual imagination. That imagination may well be, and in most cases is, that of a person who will make a successful company by developing that particular idea into something useful to the economy.

Q. Do you believe in sharing the results of your engineering and manufacturing research with general industry?



A. We have a program here of patenting all of our ideas. We have not as yet ever sued anyone who has infringed our patents. There have been many organizations who have infringed. We do expect that we are going to lead the field as we always have in the arc welding area and that other people will continue to copy what we do as they have done heretofore.

Q. Do you feel that competition so far this year is tougher than that experienced in 1954?

A. No. I think it is getting easier. Competition is less keen at the present time than it has been many times before. If you go back to 1932, '33 and '34 then competition was extremely keen because it was a matter of life and death whether an industry would continue or not. Now any industry can continue provided they are doing a half way good job.

Q. How do you feel about the future in regard to your company and its industry?

A. We expect that every year from now on will be a greater year than the year previously. We would be very much shocked if we thought anything else. We believe thoroughly in the future of the United States and our company. We believe more still in the development of welding which has a tremendously greater future than anything which has occurred so far in its applications.

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Blue Book Washington Correspondent

Government-Industry Conference

Thirty-three representative tool and die industrialists took part in an important meeting held by the Business and Defense Services Administration, U. S. Department of Commerce, on March 29. Charles F. Honeywell, Administrator of BDSA, presided at the Conference with Ralph R. Baldenhofer, Director of the BDSA Metalworking Equipment Division, leading the discussion, Secretary of Commerce Sinclair Weeks particularly welcomed the conferees, and Administrator Wendell B. Barnes of the Small Business Administration was the principal speaker at the luncheon meeting. There were also representatives from the White House, Department of Defense, Air Force and from some other Agencies of Government.

The Secretary of Commerce, welcoming the conferees, stressed that the Department is especially interested in any effort to maintain an adequate supply of special skills in industry. He laid great stress on the aim of the Government through BDSA to encourage such conferences.

- manpower shortage in tool and die industry
- in 25 years industry will have one third as many skilled workers as they have today
- many foreign machine tools at Canadian International Trade Fair
- machine tool new orders highest since Nov. 1953
- 1200 commodities may now be shipped without export licenses
- U.S. to participate in foreign shows
- foreign trade battles shaping up

Administrator Barnes, of the Small Business Administration, outlined the three principal functions of SBA which are designed to help small firms to obtain a fair share of Government contracts; to obtain competent management and technical production counsel; and to help the smaller concerns to find access to adequate credit at reasonable rates.

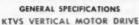


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Cutaway shows why the Baker spindle preloading prolongs drill life. Ball bearings also lengthen tool life. These, and many other features mean money to you. Contact the nearest office of F. F. Barber Machinery, or write Baker direct.

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DRILLING...TAPPING...KEYSEATING...CONTOUR GRINDING MACHINES

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Suggestions of the representatives of the industry that they are sustaining sharp losses as a result of cutbacks in defense orders, and that some of the industry's trouble stems from the tendency of prime contractors to produce their own tools and dies, in many cases using Government-owned shops and equipment, impelled a representative of the Department of Defense to admit that the procurement services of the Department are aware of such problems and are working on plans which it is hoped will result in a more satisfactory distribution of defense requirements. The Air Force spokesman emphasized that his Service does not furnish facilities—for producing tools and dies-where there is any remote opportunity to secure the product through private capacity which is able to do the job.

Industry spokesmen urged strongly that the new commodity classification for the products of the industry recently developed by a Task Force, appointed by BDSA, be adopted for use throughout the Government. It was urged that a reporting procedure be developed that would provide the Government with essential data to indicate business trends, on which to base sound mobilization programming.

Manpower Shortage

Probably the chief subject of discussion by most of the members of the industry was the growing manpower. shortages in the industry which the speakers insisted pose a threat to rapid build-up of production essential to national defense in an emergency. It was repeatedly stressed the shortage is one of the most acute problems facing the industry and other industries allied to the tool and die industry.

The manufacturers brought out forcefully that lack of proper apprentice programs is the largest single factor, and is admittedly the great trouble of the industry. In some areas it was stated labor contracts likewise are a difficult factor. In the Detroit area, for example, it was declared that only one apprentice was allowed for every fifteen journeymen, up until two years ago, when a new contract cut this ratio to one to every eight. It was very apparent the industry also considered this ratio inadequate.

At the present rate of training skilled tool and die makers, the manufacturers pointed out, the industry in twenty-five years, instead of increasing its manpower, would have only onethird the number of skilled workers it has today. It was suggested that a public relations program with high schools is very essential to emphasize the dignity and the rewards of learning a skilled trade, if the industry is to survive.

Spokesmen for the industry emphasized the need of continuing draft exemption for apprentices as well as for a better understanding of the essential needs of tool and die workers in the nation's economy, particularly in times of emergency like these.

The contract tool and die industry was described by the manufacturers as small business. There was much stress on the fact that the average number of workers in the 2500 to 3000 shops in the United States is thirty. Many of the shops employ only five or six workers.

Canadian International Trade Fair

The Canadian Embassy in Washington advises that the machine tool section will again be the largest single trade category in the Canadian Inter-

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Directly behind the screen in each tube is a Cupro Nickel stadow mask containing more than 400,000 holes. Each hole is registered exactly with its group of ing phosphor dots on the screen and with the phosphor dots on the screen and with the phosphor dots on the screen and with the pleasance of so the mask controls the register of color—keeps the image sharp register of color—keeps the image sharp register of color true.

came to ANACONDA

beams in the color tube, Buckbee Mears Company, photoengravers of St. Paul, Minnesota, produced it. When they needed thin strip metal in which 2500 perfect holes per square inch could be etched, Anaconda

When color TV came to Anaconda, we developed a new alloy, 6% Cupro Nickel, with such uniform quality, structure and thickness (0.0075") that the microscopic holes could be etched without flaw. The new alloy also has the strength and malleability to take forming without distortion of the dot structure, and functions in a color tube without contaminating the vacuum.

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- Rolls of the Cupro Nickel strip entering coating machine to be sensitized for photographic printing.
- 2 Camera printing dot pattern on the sensitized Cupro Nickel strip.
- 3 Printed Cupro Nickel strip at right entering etching machine where acid baths plus washing and rinsing operations produce finished mask.
- ♣ Each 19" shadow mask has more than 400,000 holes, size. 010±.0005. Several areas of screen are inspected electronically to check hole size.

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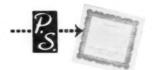
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THREAD TOOL DIV.

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national Trade Fair to be held at Toronto May 30 to June 10. At the beginning of March it was reported by those in charge that it appeared approximately 50,000 sq. ft. of space has been booked to exhibit a variety of machine tools and accessories with at least ten countries represented. Canadian firms are reported to have taken more than half the space.

Other countries which will be represented with products peculiar to their nations, are Austria, Belgium, Czechoslovakia, France, Germany, Italy, Japan, United Kingdom and the United States. There is very special interest in the character of the exhibits which will be offered by Japan, and possibly by one or two other Asiatic countries whose names are not vet made available for publication. Much of the equipment scheduled for display is reported to incorporate new features and new designs. It is anticipated that a very substantial number of responsible persons will attend the Fair, coming from the United Kingdom as well as from Japan and from Germany and other European countries.

What Can Be Shipped Without Export Licenses

The latest Positive List issued by the Bureau of Foreign Commerce of the Department of Commerce enumerates a total of twelve hundred commodities which may now be shipped to most countries without applying for individual export licenses. Included therein are machine tools. It is marked, however, that individual export licenses will continue to be required for shipments to Hong Kong, Macao, Hanoi-Haiphong and the Communist-controlled area of Indochina and the Soviet bloc. There is, of course, a total em-

bargo against shipments from the United States to Communist China and North Korea.

Foreign Grants for Machine Tools

Iran—or Persia—whose Shah and Queen recently toured the United States, shortly thereafter received a grant of \$1,247,000 for the purchase of machine tools through the Agency of the Foreign Operations Administration.

Lebanon, about the same time, received a grant of \$53,000,000, which included \$250,000 for machine tools. These also are to be procured through the Agency of the Foreign Operations Administration.

It is interesting, in connection with the foreign grants, that Secretary of Commerce Weeks will leave shortly to spend five or six weeks in Europe to promote world trade by visiting five International Trade Fairs in which the United States Government and private industry have exhibits of American products including machine tools. The trip is taken at the suggestion of the President. Secretary Weeks will visit the Fairs at Milan; Hanover; Liege and Brussels; London, and Paris. Special American Day Ceremonies are scheduled on the days that Secretary Weeks

Machine Tool Shipments

Based on an average index of 100 for the years 1945-46-47 the index for new orders reached 209.7 for February, 1955. In January the index stood at 203.0. Lowest in 1954 was November when the index stood at 119.5. The current figure of 209.7 is the highest since September, 1953 when the index reached 223.7.

attends. It is expected he will visit other cities.

It is announced before the summer is over the United States will have taken active part in fifteen Fairs in Europe and one in Japan. In the fall the United States will take part in ten additional Fairs in the Far and Middle East, together with special exhibits in Berlin and Vienna. It is reported attendance was amazingly heavy at the Fairs in the American exhibits at Bangkok, Frankfurt, and Verona.

The President draws attention to the fact that in recent years Soviet bloc countries have had costly, imposing buildings at International Fairs for promoting propaganda in regard to Communist industry, trade and working conditions. He points out the United States, with the greatest industry, the largest volume of trade and highest standard of living in the world, has been conspicuous by almost complete absence.

It is anticipated the exhibits planned will draw millions who will learn the true story of how American owners, managers and workers, living under a free political system and enjoying free enterprise, are cooperating in the production of all kinds of goods and services not only for the benefit of our own people but for all others in the world.

Economic Reports

Economic reports about general business conditions from the several Government agencies are curiously in conflict at times with the reports from non-Government agencies. The latest reports from Washington sources still emphasize the rise in industrial activity with sizeable advances in steel and auto-

mobile production and in construction. We are told in most other lines the gains are still moderate and scattered. It is pointed out that only two groups "food, beverages and tobacco" and "non-electrical machinery" (which includes farm machinery, machine tools and other industrial and defense equipment), are scarcely above their 1954 lows.

All reports emphasize that the most striking contribution to recovery and demanding more labor and materials has been the acceleration of construction, particularly the building of homes.

The Department of Commerce Survey of Current Business states: "New orders for metal-cutting machine tools, which were depressed most of last year, participated sharply in the recent upturn."

The same report begins: "Business activity in January and February extended the rise experienced in the fourth quarter of last year. It is apparent that participation in the advance has broadened. A particularly significant development is the tilting upward of the curve of plant and equipment investment indicated by the 1954 survey. This, and the general expectation of higher sales, attest to the confidence of business men in the outlook."

The Board of Governors of the Federal Reserve System in their National Summary of Business Conditions report: "Industrial production increased further in February and early March. Construction activity in February was at a record for the season, and retail sales were maintained at advanced levels. Unemployment continued to show a less than seasonal rise. Average wholesale prices declined slightly in February and early March reflecting decreases for farm products, foods, and



a few industrial materials. Demand for bank credit continued strong.

"Output of primary metals and autos continued to advance in February. Steel production has increased further in March to about 92% of current capacity and to a tonnage rate close to the record of early 1953. Auto assembly in early March continued at the record weekly rate of about 170,000 reached in February."

The United States Steel Corporation issued for release after March 16, 1955, its Annual Report for 1954, stating "It records a 21% decline in ingot production for that year from the record-breaking level of 1953 with a 12% drop in income dollars.

"Maintenance of a relatively high income partly was due to: (1) Termination of the excess profits tax, (2) more efficient facilities (\$2.5 billion spent since 1945) and, (3) the orderly manner in which management anticipated and carried out plans for meeting a year of adjustment."

The report points out "Today it takes \$2.60 to buy as much construction as could be purchased for \$1 in 1940. The depreciation dollars recovered today, based on the dollars spent many years ago for facilities, are simply not enough dollars to replace those facilities—not enough dollars to equal the buying power originally expended for those facilities."

Foreign Trade Policy

There are two battles over foreign trade policy in Congress.

One involves the three-year extension of the President's power to make trade agreements and to cut tariffs by an additional 15% which already has been vigorously opposed in the Senate.

The second involves a bill to approve United States membership in the Organization for Trade Cooperation, a new international body formed recently at Geneva. This OTC will administer the general Agreement on Tariff and Trade better known as GATT, which has been functioning for about eight years.

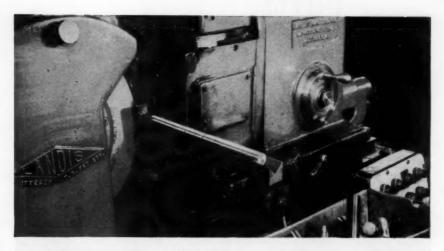
Senator Byrd, (D., Va.), Chairman, Senate Finance Committee, served notice on Secretary of State Dulles that his Committee will not act on the Trade Agreement bill until it is given all the details of the new international trade organization. Senator Byrd holds his Committee is entitled to know all about the international setup before it gives approval to either bill. Apparently he and his followers do not trust the plan to give the President extraordinary powers of this kind in so-called emergency situations.

Thirty-four nations have joined in organizing the new Agency to supervise fair trade practices. Senator Byrd said it is to be directed by an Executive Board composed of representatives of seventeen nations, "and we have only one vote."

The Senator wants to know just how this Board will function.

GATT has been a subject of controversy in Congress since this country first joined in the Geneva trade talks. Last year Congress stipulated that nothing in the current Trade Agreement Act should be construed as approval or disapproval of GATT.

Senator Millikin, (R., Colo.), caused Secretary Dulles to agree to furnish each Member of the Finance Committee with a detailed explanation of the Trade Agreement now covered by GATT and how the new OTC governing body will function.



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Studs for high-pressure high-temperature service ranging from 5%" to 1%" in diameter are threaded from blanks of SAE 4140 steel heat-treated to a 260-320 Brinell hardness. In the operations illustrated, 11%" 8 pitch UN threads must be generated 10" long to a Class 7 fit to meet ASA standards (Manual B 1.4). These threads are produced with LANDIS #1 Centerless Thread Grinders by continuous thru-feed grinding at the rate of 7½ linear inches per minute, or better. The excellent quality and smooth finish of the ground thread has reduced final assembly time and minimized galling.

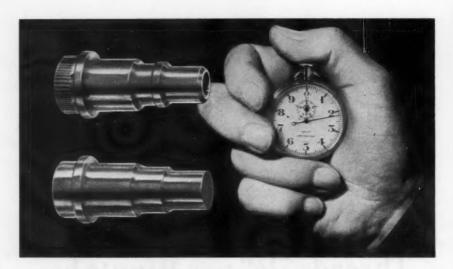
Centerless Thread Grinders, manufactured exclusively by LANDIS, are designed for the high-speed threading of a wide variety of workpieces from ½16" to 4¾" in diameter. Blanks having one or more diameters, requiring threads on the outer diameter, can be threaded automatically by the thru-feed process as used here at the Kilbourn Engineering Company in Milwaukee, Wisconsin.

For further information, send specifications and ask for Bulletin E-97.





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Deep Drawing Aluminum Alloys

by James K. Wareham

Aluminum Company of America Alcoa Process Development Laboratories New Kensington, Pennsylvania

One of the most important fabricating methods for the production of aluminum parts is the deep drawing process. This type of fabrication may be employed with any of the wrought aluminum alloys.

During recent years, the aluminum industry has expanded greatly the capacity to produce aluminum sheet required for deep drawing. As a result, the supply is adequate to meet both military and civilian demands.

The size and rates of production for deep drawn aluminum parts are governed only by the actual requirements. For example, small eyelets, bottle caps, light bulb sockets and film containers are made in thousands per hour on high speed presses and transfer type tools. Large shells used for such products as drums, tanks, boxes and containers which must be manually handled between operations are produced at slower speeds. Figures 1, 2,

3, 4 and 5 are typical examples of drawn articles.

Selection of Alloy

The selection of the proper alloy and temper is of paramount importance when considering aluminum. The cost of the ultimate product is governed by this choice. The wrought aluminum alloys may be used are numerous, and they can be supplied in several tempers.

Table 1 shows the composition of the commonly used nonheat-treated and heat-treated wrought alloys. The mechanical properties of the former are increased by cold working the metal. The latter contain alloying constituents that make possible an improvement in mechanical properties through heat-treatment. Tables II and III give the mechanical properties of the non-heat-treated and heat-treated alloys respectively.

The size, shape and operating (or



Figure 1



Figure 2



Figure 3



A few typical examples of parts which have been drawn out of aluminum.

service) conditions are a few of the factors that affect the choice of material. Commercially pure aluminum, in the annealed condition, is ductile and can be drawn to greater depths than brass, copper or steel. Its comparatively low properties, however, preclude its use for many items. Other alloys are drawn from annealed blanks or metal in an intermediate temper, depending upon the severity of the draw and the type of tools. Most products are made from 1100 or 3003 because of the ease with which they can be formed. Their strength has been found to be adequate and they are also lowest in metal price. Items subjected to hard usage, wear, high temperature or pressures are made from 3004, 5052, 5154 or one of the heattreated alloys. If the part is to be anodically treated, some other alloy such as 5050 or 5357 may be selected.

The excellent workability of the aluminum alloys enables the manufacturer to perform practically all drawing operations at room temperature. The metal work-hardens gradually but there is sufficient ductility left after each draw to permit several operations to be performed without having to resort to intermediate anneals. Figure 6 shows a cake pan which has been made of 3003 alloy. Thirteen different operations, including the trimming and beading, are done in successive steps.

The heat-treated alloys are handled

differently. It is possible in some cases to heat-treat the blanks and draw immediately, or reasonably soon thereafter. In other instances, the drawing is started from annealed blanks and the heat treatment is performed at some intermediate point or after the drawing has been completed.

Equipment

The type of equipment used to draw aluminum is identical to that used for other metals. Most of the experience obtained in its potentialities has been gained by experimenting with trial lots

5. Another part drawn out of aluminum.

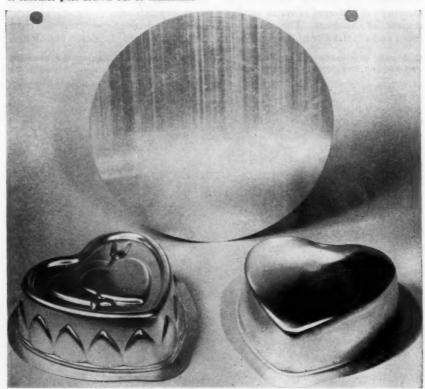


TABLE I

Nominal Chemical Composition of Wrought Alcoa Aluminum Alloys

Alloy						Per	Cont	of Alloying	Flaments*
Commercial Designation	Cu.	Si.	Mn.	Mg.	Zn.	Cr.		Remarks	
1100	-		-	_		-	99%	Minimum	Aluminum
3003	_	-	1.2		-	-	/0	· · · · · · · · · · · · · · · · · · ·	Zidiiiiidii
3003 3004	-		1.2	1.0	-	_			
5052	-	-	-	1.0 2.5 3.5	_	0.25			
5154	-	-	-	3.5	_	0.25			
2014	4.4	0.8	0.8	0.4	_	-			
2024	4.5	_	0.6	1.5	_	-			
6061	0.25	0.6	-	1.0	-	0.25			
7075	1.6	-	-	2.5	5.6	0.30			

*Aluminum and Normal Impurities Constitute Remainder

of material in tools already in existence. A common practice is to obtain sample quantities of different alloys in varying degrees of hardness. The operating limits and adaptability of the aluminum

as a possible substitute for present metals can then be explored without large expenditures.

Single, double and triple-action presses are used to draw aluminum.

6. A cake pan made out of 3003 alloy. Thirteen operations, including the trimming and beading, are done in successive steps.

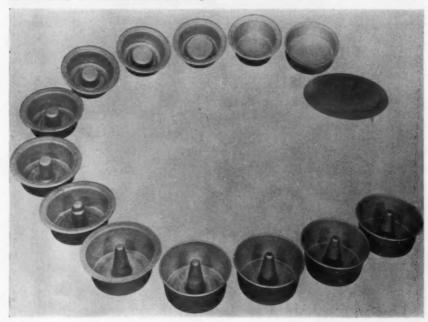


TABLE II

Typical Mechanical Properties of Nonheat-Treatable
Wrought Alcoa Aluminum Alleys

Commercial designation	Ultimate Tensile Strength Lbs./Sq. In.	Yield Strength Lbs./Sq. In.	Elongation Per Cent in 2"	Brinell Hardness 500 Kg Load, 10mm Ball
1100-0 1100-H12 1100-H14 3003-0 3003-H12 3003-H14 3004-H32 3004-H32 3004-H32 5052-H32 5052-H34 5154-O 5154-H32	13,000 15,500 17,500 16,000 19,000 21,500 26,000 31,000 34,000 37,000 35,000 39,000	5,000 14,000 16,000 6,000 17,000 19,000 22,000 27,000 12,000 27,000 31,000 31,000 33,000	35 12 9 30 10 8 20 10 9 25 12 10 25 14 11	23 28 32 28 35 40 45 63 45 62 67 70 78

These are hydraulic or mechanical types. Simple shallow draws are made on single-action machines with or without spring, air or hydraulic die cushions. Deep draws using blankholder pressure at each step require double or triple-action presses.

The quantity, size and variety of work to be done dictate the type of equipment to use or purchase. There are high production presses on the market that can be used to good advantage. These are equipped with progressive dies or a dial feed and coil cradle. Here the metal is purchased in coils weighing as much as 2,000 pounds or more. The operations are automatic after the material is started through the press. Multiple draw parts are made at rates of 80 to 120 pieces per minute on this kind of equipment.

Die cushions are used to provide an additional action to single and double-action presses. Single-action presses can perform light and medium draws with the air or hydraulic cushion acting as a blankholder. Die cushions provide the means for triple-action operations when installed on double-action presses. The resulting blankholder pressure is uniform and can be regulated to suit by merely adjusting a valve. Cushions are also used to eject shells from the tools automatically.

Presses vary in speed. This factor merits consideration when drawing aluminum. Light draws, blanking and piercing are done on presses having a ram speed of 40-80 feet per minute. On the other hand, deep draws are made at speeds of less than 50 feet per minute. It has been found that the stronger alloys can best be drawn at slower speeds in the range of 20-40 feet per minute.

Hydraulic presses are becoming more popular for deep drawing work because of the steadier speeds and the control that can be exercised. The initial impact as the tools contact the metal is greatly reduced. This permits the metal more opportunity to flow without in-

TABLE III
Typical Mechanical Properties of Heat-Treatable Wrought Alcoa Aluminum Alloys

Alloy and Temper Commercial designation	Ultimate Tensile Strength Lbs./Sq. In.	Yield Strength Lbs./Sq. In.	Elongation Per Cent in 2"	Brinell Hardness 500 Kg Load, 10mm Ball
2014-0 2014-T4	27,000 62,000	14,000 40,000	21 22	45 105 135
2014-T6 2024-0 2024-T3	70,000 27,000 70,000	60,000 11,000 50,000	11 19 18	135 47 120
2024-T4 6061-0	68,000 18,000	48,000 8,000	20 22 22 22	120
6061-T4 6061-T6	35,000 45,000	21,000 40,000	12	30 65 95 60
7075-0 7075-T6	33,000 82,000	15,000 72,000	11	150

curring fractures and consequently high scrap losses.

Several different kinds of draw presses have been developed in recent years which use rubber in one form or another in combination with metal tools. These are usually identified by the trade names "Hydroform," "Marform" or "Verson-Wheelon." The principal involved is one of causing metal to assume the shape of the punch by pressure applied against soft rubber or a rubber bag. The metal is restrained or controlled during the forming process by blankholder pressure around the outer edge. Irregular shapes and shells with compound curves, such as a parabolic reflector, can be made with a minimum of tool expense and usually in one draw. The punch can be made of steel, Kirksite, plastic or some other material depending upon the quantities, finish, tolerance and complexity of the finished article.

Tools

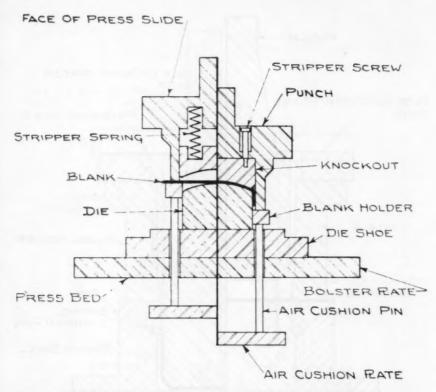
The tools used in drawing aluminum may be divided into four parts: blank-holder, die ring, punch and knockout. These are similar to those used for other metals. Figures 7, 8 and 9 show

cross-sections of tools in single and double-action presses.

Draw tools are made from close grain cast iron, carbon steel or high grade tool steel. Cemented tungsten carbide inserts are used on high production jobs where finish is most important and maintenance is to be kept low. Boiler plate is commonly used, especially for blankholders. The material and quality depend on volume, type of draw, alloy of sheet to be drawn and the finish required.

Cast iron tools, when made with a close grain structure, have given excellent results. Machining costs are kept to a minimum by being able to cast to finished shape. Some grinding, filing and polishing is all that is needed to complete the tool.

On large production runs where the extra tool cost is justified, high-grade alloy tool steels are specified. They are also used for drawing shells from hard alloys and on work where scratches must be kept at a minimum. Oil hardening steels usually are used to obtain the maximum hardness with minimum distortion during treatment. The hardness should be in the range from Rockwell C 60 to C-65.



7. Draw tool for single press with air cushion mounted underneath press bed.

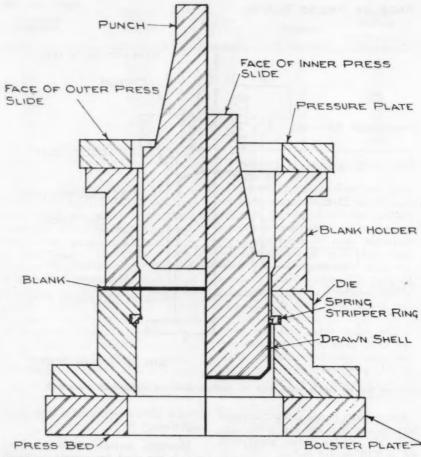
Intermediate in cost and performance between cast iron and high-grade alloy steels are regular carbon steels with 0.6 to 1.10 percent carbon.

Kirksite and other low melting and easily worked alloys are extensively used for tools on comparatively short runs. The tools are melted after the completion of the draw, and the metal is re-used. This results in economies in tool cost and eliminates storage prob-

lems so often encountered in large press operations.

Masonite, pressed woods and hard woods are used for sample or small quantities, particularly where the drawing is done by one of the rubber forming processes.

The art and science of making plastic tools has advanced to the point where these tools are being used for large production. The material from which

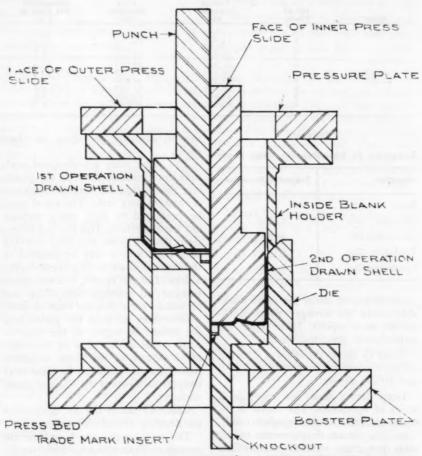


8. First operation draw in doubled acting draw press.

they are made is a thermosetting liquid phenolic plastic. It is mixed cold and can be readily poured without pressure. The cast is cured by heating to 160° F. for 12-18 hours. Shrinkage is negligible, and parts can be cast to finished size.

Binders or reinforcing such as glass cloth are usually added to the plastic to give it additional strength.

Regardless of the material used, the tools must be made strong and rugged enough to perform the drawing with-



9. Final operation draw, trade marking and bottom forming in double acting draw press.

out any expansion or change. The metal must be controlled completely. harder tempers with a corresponding

Tool Design

Aluminum, like other metals, strainhardens during the draw operations and changes from annealed to the harder tempers with a corresponding increase in tensile and yield strength. As a result, they become less workable, and the reductions made must be decreased in successive draws. The softer,

TABLE IV

Effect Of Drawing On Mechanical Properties

Alloy	No. of Draws	Tensile Strength, psi	Yield Strength, psi	Elongation, Per Cent in 2 in.
3003	0 1 2 3	16,000 18,740 22,140 23,710	6,000 16,700 20,800 21,900	30.0 11.0 9.0 8.0 7.5
5052	0 1 2 3 4	24,240 29,150 34,390 39,710 42,680 43,750	22,300 14,200 31,600 37,100 38,600 36,100	27.0 6.0 5.0 5.5 6.0

TABLE V
Reduction In Diameter For Deep Shells

Operation		Suggested	Reduction	
Blank (D)				
First draw (D ₁)		0.40	D	
Second draw (D ₂)		0.20	D ₁	
Third draw (D ₃)		0.15	D ₂	
Fourth draw (D ₄)		0.15	D ₃	

non-heat-treated alloys are most workable, while the stronger alloys workharden more rapidly. These factors are important in good tool design.

Table IV shows the effect of drawing on the mechanical properties of 3003-0 and 5052-0 alloys.

Deep drawn shells are made in a series of operations. The metal is usually ordered in the annealed condition. This permits the maximum reductions per draw without intermediate annealing. The first reduction of 40 percent can be followed by subsequent draws of 20 and 15 percent. These values are typical and must be reduced where blankholders are eliminated, or the harder and stronger alloys are used.

Table V shows the suggested reduc-

tion in diameter per draw for deep shells.

The draw tools are designed with sufficient clearance between the punch and die so that the original thickness is changed very little. The metal must be premitted to flow freely without any ironing effects. This practice differs from that for brass and deep drawing steel sheet which may be reduced in thickness as much as 50 percent during a draw. For this reason, it is sometimes necessary to redesign tools which had previously been used on brass or steel.

Clearances between the punch and die should be equal to the gage of metal to be drawn plus an allowance of 10 percent of the metal thickness. Ironing of the shell can be done after the part is drawn to the finished inside diameter.

Table VI shows the die dimensions for drawing cylindrical shapes.

The radii on the punch and die are important. First operation tools are designed with as generous radii as practical. The radius on the draw die edge should normally be no less than four times and no more than fifteen times the original thickness of the metal being drawn. The proper radius to use will depend upon the alloy and temper of

First draw
Second draw
Third and succeeding draws
Final draw of tapered shells

Punch diameter plus 2.2 times thickness of blank Punch diameter plus 2.3 times thickness of blank Punch diameter plus 2.4 times thickness of blank Punch diameter plus 2.0 times thickness of blank

the blank and type of draw. The punch radius should be kept to a minimum of four times the metal thickness and preferably 6 to 10 times the gage of metal to be drawn. If the radius is too large, wrinkles may occur in the shell sidewall. A radius which is too small will resist the flow of the metal and cause fractures. The radii may be sharpened where necessary by restrike operations.

Figure 10 shows a typical operational line-up for a cylindrical shell.

Rectangular boxes and pans are the most difficult to draw. The die ring radius is kept the same or slightly larger than used on round items. This is particularly true at the corners where the greatest flow of metal takes place. This movement must be controlled to prevent wrinkles and scrap losses. Provision for this factor can be made by varying the die radius. As a general rule for a first draw, the radius of the vertical corner of the shell should not be less than six times the sheet thickness and preferably not less than three-eighths inch.

Figure 11 shows steps used in drawing a rectangular pan.

Hemispherical shells are drawn in one or two operations depending upon the relation of the diameter to the metal thickness. They require complete tooling and must be done on a doubleaction toggle press or the equivalent. When the ratio of the diameter of drawn shells to the original metal thickness is less than 200, one draw should be sufficient. If this ratio is greater than 200, two draws are needed to obtain a wrinkle-free shell. This is one case where rubber die forming can be used to advantage. Parts can be made in one draw and with excellent finish, as no tool marks will be evident.

Figure 12 shows the two operations needed to draw a light gage hemispherical shell.

The starting blanks are usually a development during tool try-out. This is especially true for irregular shapes. An estimate of the size and shape can be made, but it is suggested final decisions and metal orders be withheld until tool try-outs are complete. Excessive metal in the blanks will only add to the metal cost and often complicate the drawing.

Tool Finish

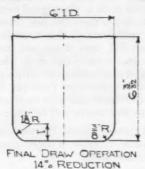
The working surfaces on tools used to draw aluminum should be polished. Fine scratches or imperfections on the surfaces will retain dirt particles and foreign material which will result in scratches on the surfaces of the formed aluminum. These detract from the appearance and add to finishing costs if the article is to be polished.

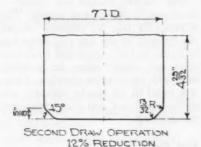
A still more serious effort of poorly

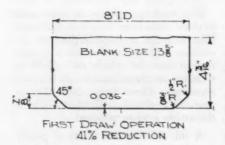
polished tools is the greater resistance to flow of metal which is incurred. This can be a prime factor in the success or failure in drawing aluminum.

Lubricants

A lubricant for drawing has two important functions. First, it allows the 10. A typical operational line-up for a cylindrical shell.





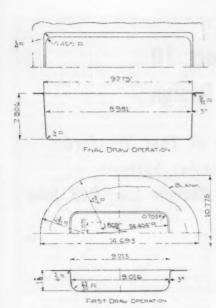


blank to slip readily between the blankholder and the die. Second, it prevents scratching and galling while this movement takes place. Mineral oils and compounded mineral oils are most often used. The major oil companies and those concerns specializing in lubricants have developed, in recent years, complete lines of oils for light, medium and severe drawing of aluminum. Compositions of mutton tallow and paraffin are used a great deal for heavy draws. This practice is being replaced where possible by commercial lubricants because of the expense of applying and removing the lubricant.

The choice of lubricant is a matter for each individual shop to decide. Experience dictates preferences. Cast iron and low carbon steel tools require a heavier lubricant to prevent scratching than do high grade hardened and well-polished tools. The oxide coating found on aluminum in varying degrees is another factor in selecting a lubricant. The harder alloys usually have a thicker coating and consequently require heavier or different lubricants than commercially pure aluminum.

Open containers for storing lubricants should be avoided. Dust and dirt will be picked up in quantity which will then be transferred to the metal. This can be a real source of trouble.

A lubricant should be selected by the draw results, method of application and ease of removal. Some oils have excellent drawing characteristics, but are rejected because they cannot be removed by economical methods. Most shops are set up to do all degreasing of all materials by one method—usually a hot water spray to which some detergent has been added.

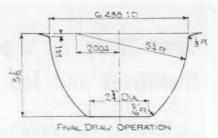


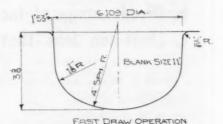
11. Steps used in drawing a rectangular part,

Finishing

Aluminum in its natural state has a sufficiently pleasing and satisfactory appearance for most drawn articles. It can, however, be changed or improved by several processes. Some finishes are applied mechanically by grinding, buffing and polishing. Others can be applied by chemical or electro-chemical processes that produce coatings suitable for decorative and protective coatings, or both. Bright chromium and nickel are being plated on certain aluminum products to add to their sales appeal and attractiveness. Paints and lacquers are also used for color and protective reasons. Porcelain enamels are a recent development as a coating for aluminum.

As experience and knowledge con-





12. Two operations needed to draw a light gage hemispherical shell.

tinue to be gained of the adaptability and versatility of deep drawing aluminum, the fields of application for this process will be widened still further.

Better drawing alloys are being developed, as well as fabricating methods, tools and lubricants. All these contributing factors are making the metal more and more acceptable to the fabricators.

The End

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Time Study . . . part 10 Incentives and Job Design

- a. Proving the Validity of Your Standard
- b. Disadvantage of Incentive Systems
- c. Short-Run Jobs That Become Long-Run Jobs

by **Harold R. Nissley**, Professional Engineer Cleveland Heights, Ohio

Cartoons by Glueckstein

Proving the validity of your work standard

HOW do you indicate to the operator that he has contributed a fair day's work for a fair day's pay? This question has been dealt with in earlier articles in the BLUE BOOK¹. But the problem of selling fair work standards is so common that additional space is devoted to it in this article.

Considerable heat is frequently generated over the speed rating of operators. The Union stoutly affirms that no one can judge operator skill and effort within reasonable limits. The company (time study engineers) blandly assert that operator speeds can be estimated within a tolerance range of plus or minus five per cent (10 per cent at the most).

Both of these views are correct!

When body-member skill and effort is closely integrated with visual inspections and mental decisions, then operator rating becomes very difficult even though the rater breaks his rating technique down into elemental ratings. But when motions are simple (e.g. walking, simple movements of the fingers, arms, and legs), then good time study observers who make daily or weekly production floor studies are able to speed rate operators within the plus or minus 10% tolerance limits that most time study observers try to operate within.

As pointed out elsewhere in this series of articles, the rating argument diminishes when standard data (based on several time studies) or tabular time

¹See the writer's article in the March, 1954 issue of the MACHINE AND TOOL BLUE BOOK, "How to Make Your Time Study Standards More Accurate and More Salable." Also: The May, 1948 issue of MANAGEMENT REVIEW (AMA), "The Reliability of Time Study Standards."

Most inventive arguments do not center around operator rating as many think. Most grievances center around how much time an operator should spend at his bench or his machine WORKING. In other words, most managements do NOT expect their operators to SPEED UP (in most cases); most managements merely want their people to work oftener during the 8 hours they are receiving compensation. Industrial engineers will, therefore, find their standards more salable, in most instances, if they attempt to sell them on the basis of $7\frac{1}{2}$ hours of demonstrated performance for 8 hours of pay.

Many operating men and industrial engineers point with pride to the many advantages accruing to an incentive system—especially the one outstanding advantage of increased productivity (20% to 40%). They seem to forget the adage: "You don't get anything for nothing."

There are incentive plans in operation today that cost more to operate than all the good derived therefrom —when all of the direct, indirect, and intangible costs are added together.

But the increase in the number of incentive plans during the past two decades attests to their pragmatic worth. Discussion in this article centered around the disadvantages of incentives because some consultants and many operating men gloss over or minimize many of the disadvantages pointed out in this article.

There are two solutions to the problem of the short-run incentive job that unexpectedly turns into a long-run job: (1) The diminishing subsidy plan: and (2) the flexible piece rate plan that is tied in with production runs. Unless management recognizes the problem and applies remedial action, management is unwittingly aiding and abetting incentive creepage.

systems are used. That is the reason that most consulting engineers today lean heavily in the direction of either the standard (local) data system or some such system as Methods-Time-Analysis (MTA) Work Factor, Methods-Time-Measurement (MTM), and others too numerous to mention.

But between these two extremes the single time study technique and the standard data or tabular systems techniques—lie other simpler and even more convincing techniques which are constantly by-passed by a hard-pressed and harrassed time study department. One of these is the batch or over-all timing technique.

Although good time study technique

demands that jobs should be broken down into elements and each element timed (and rated), such refinement may not be understood or convincing to operators and stewards. But when batch or over-all timings are taken (simultaneously with elemental timings) then the time study engineer is able to move within the understanding of the operator and the steward.

Example—A Case History. For several months a group of day-work operators had been turning in 73 units a day on a fine assembly operation. During a 60 minute time study one of these operators filled a pan with these assemblies (50 assemblies). Without any comment from the time study man,

the operator said: "Look, I've just finished 50 of these while you were standing here. The materials must be running good as I have never done that many before in an hour."

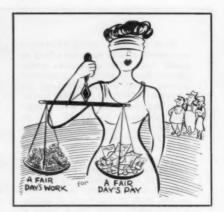
The time study man went back to his desk and set a standard of 45 assemblies an hour (compared with the group average of 9 per hour up to that point). A grievance was filed.

When the union steward was told one operator had demonstrated she could turn out assemblies at the rate of 50 an hour, he said: "I know some fellows who can run a mile in 5 minutes. But I don't know anyone who can average 12 miles an hour on foot. Do you?" "Sure these girls can put on a spurt demonstration for anyone; but not one of them could keep it up all day long."

The Personnel Manager finally suggested that 8 hour studies be made of this operation to determine the extent of an operator's ability to maintain a 45-per-hour assembly rate. Much to the surprise of everyone, this group of assemblers averaged 345 assemblies for the 8 hour period (compared with the 73-per-day average before time study).

Another meeting was called. Said the Union: "You could not expect these girls to keep up that pace day in and day out week after week. These girls were so exhausted when they went home that night that two of them could not come to work the following day."

So Management suggested that weekly studies be made of this job to satisfy everyone that there was not (or was)



cumulative fatigue at these higher production plateaus. One week of 8 hour studies confirmed the earlier figures.

The Company finally settled this dispute on the basis of 40 assemblies an hour—better than a 300 per cent increase over the previous production rate. But of equal importance to the increase in production was the rapport that developed between the time study observer and the operators. He got to know them and their problems better; and they developed a better appreciation of his problems and point of view.²

Note throughout the foregoing case nothing was said about rating although operator speed rating was implied. But this case illustrates the typical situation in most plants: Most operators will demonstrate good work performance during the time study observation. The discrepancy between the rate of performance at the time of the production floor study and the daily average is simply due to the operator's failure,

²It's surprising how much one can learn by sitting down with others and listening. Samuel Gompers, the great leader in American trade unionism, received a liberal education made possible by his fellow cigar makers who chipped in and paid him for reading to them (instead of making cigars).



It's surprising how much one can learn by sliting down with others and listening. . . .

in most cases, to apply himself consistently throughout a 71/2 hour period.

The time study engineer should, therefore, attempt to gain the operator's cooperation in putting forth honest effort during the time study. Then he should support his elemental time recordings with over-all or batch times so that anyone can easily check his figures (without the benefit of a decimal minute stop watch). Indeed, one consultant even goes so far as to ask the operator, if he would like to time a batch himself and then lends the operator one of his watches.³

Disadvantages of incentive systems

The literature abounds in praise about incentive systems. However the incentive story is far from one-sided. But before probing the negative features of incentive systems, let us review the positive features. A good incentive system will: (a) increase production from 20% to 40% (in most cases); (b) enable the user to control costs better; (c)

narrow estimating tolerances; (d) focus attention on producers and non-producers; (e) spread factory burden over a larger number of units and hence reduce unit costs.

Offsetting these advantages (in part at least) are the following disadvantages: (a) High administrative cost (compared with operating a day work shop); (b) frequent debilitating grievance sessions; (c) diminished supervisory diligence after the introduction of an incentive plan.

Cost of Administering an Incentive System. The direct costs of administering an incentive system are, of course, the salaries of time study personnel, time study watches, forms, etc.; office space occupied by time study personnel and trips and expenses incurred by time study personnel. These items can—and frequently do—amount to a tidy sum when totalled over a year of time study activity. Percentage-wise these costs typically range from 2% to 4% of the direct labor payroll with many companies spending more than 4% (and a few less than 2%).

Dollar-wise 2% to 4% of any direct labor payroll is nothing to sneeze at in most industries (where direct labor runs from 15% to 30% of total factory costs). Unfortunately, the abolition of an incentive system does not obviate the need for work measurement. Indeed, an increasing number of daywork shops are setting up time study departments for estimating and other purposes; and many day-work shops have had formal time study departments for over a decade.

But the incentive shop typically needs a higher grade of time study personnel

³This is an old sales technique. Any car salesman knows that he is getting closer to a sale, if he can get the customer behind the wheel of his automobile and let the customer drive the car so as to give him the "feel" of the situation.



(and more of it) than does the daywork shop. This may be another way of saying there is not the constant pressure for accurate work standards in day-work shops compared with incentive shops.

In the light of these facts it would probably be fair to assess half the foregoing cost figures to incentive operation. In other words, if your time study activity is adequate under day work operation, it is costing you from 1% to 2% of your direct labor payroll. If you decided to go to incentive this cost, as pointed out above, would double.

Incentive Grievances. So far we have discussed only the directly measurable costs of an incentive program. There are many hidden costs to such a program. Many of these are tied up with grievances. How many hours a week are spent (and by whom) in arguing about piece rates?— about methods changes—about payment for scrap—about down time? The writer has seen some companies that spend more money in incentive grievances than they spend in setting standards.

But the direct and indirect costs in dollars is only part of the story. How much ill will is generated when foremen, operators, union officers, personnel directors, time study observers, industrial engineers, and others spend days (and nights) arguing about a single rate? And when the parties fail to reach an agreement, how much damage is done when a strike ensues as a result of a "speed-up" grievance? Thus the intangible costs of an incentive system could out-weigh the measurable costs.

But is the core of this problem incentives per se? Would it be fair to say that a company that has many incentive grievances has many non-incentive grievances? Indeed, it is quite probable that a company that has a large number of non-incentive grievance has a large number of incentive grievances. So let's not make incentives the scape goat for management's failure to provide the proper kind and amount of industrial engineering skill; for management's failure to grant sufficient latitude to its personnel department in dealing with the union; for union recalcitrance based on real or imaginary abuses of the past.

Do Incentives Encourage Supervisors to Lower Their Guards? Incentives have often been called "silent monitors"—monitors that work for you when you are not around. Although there is much truth in this, many supervisors overrate this characteristic of incentives. They overrate it in two respects: (1) They think a switch from day-work operation to piece work operation will enable them to pursue other matters because this "automatic" or silent monitor will be working even when they are not around. (2) They think (hope) the heat will be off of them for pro-



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duction because the chore of setting work standards is no longer theirs. (Assuming no formal time study prior to the incentive installation).

Any high school study hall teacher knows that more work will be accomplished by students when the study hall is carefully supervised than when it is not. Many foremen have learned from unhappy experience that it is not safe to leave their departments completely alone for hours at a time. But the typical day-work foreman envisages more "free" time after the introduction of incentives.

Many foremen will sit back and let the industrial engineering department fight out their production battles. And this lackadaisical attitude may not be their fault. The fault may lie with the industrial engineering department. A few industrial engineers have forgotten their function in a company organization. And a few companies, after some bitter loose rate experiences, have laid down the law that all work standards shall be the sole province of the industrial engineering department—without any interference from supervision.

Without analysing or attempting to rationalize these various points of view let us return to fundamentals of good organization: The two principle kinds of management people are (a) line and (b) staff. Line people are the doers or the executers; line people have been chosen because of their ability to get along with others and to get others to work for them in turning out production. Staff people are not quite as good (unfortunately) at getting along with people and getting out production. However staff people are selected for other qualities: ideas-workable ideas. But a staff person usually finds himself



in trouble when he attempts to execute these ideas in their final form; witness, for example, what happens when the design engineer attempts to fabricate his own design or even to get a group of workmen to fabricate it for him (except under laboratory conditions).

A design engineer, therefore, will turn over his design to the production department for execution (after it has received the necessary approvals). A good design engineer may, of course, follow his new design through the various production phases to make sure his blue prints are properly interpreted (or more commonly-to suggest changes that occur to him after his design gets into production). But the smart design engineer will not run around a shop or a department telling various workmen what they should do -unless the foreman has instructed his operators to work closely with the design engineer.

In much the same manner the time study engineer will work out his stand-

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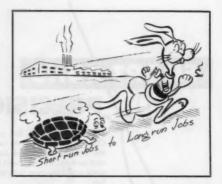


ard and attempt to "sell" his standard to the foreman. It is then up to the foreman to sell the standard to the operator. Of course, the time study engineer should be ready and willing to assist in this selling phase on occasion; but the time study engineer should not spend most of his time doing the foreman's work. And part of the foreman's work is seeing to it that his operators turn out a fair day's work for a fair day's pay. The foreman can, of course, reject a standard set by one of the company engineers. Or the operator can enter a grievance against a standard which the foreman and the engineer believe to be fair. But there is trouble ahead for any foreman who changes a standard without permission of the time study department. There is trouble ahead for any operator who refuses to go to work on a new standard (instead of entering a grievance on the new standard). And there is usually trouble for the industrial engineer who attempts to deal directly with the operator or the union steward without the foreman's full permission and desires.

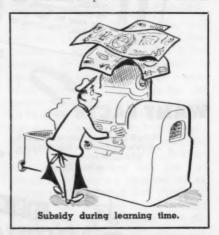
Short-run jobs that become long-run jobs⁴

What happens when short-run jobs become long-run jobs? There are several implications to this question: (1) How much skill (speed) does an operator—especially an incentive operator—pick up when his production runs increase manifold? (2) How can you adjust piece rates as operator skill and output increases?

Effect of Skill on Output. Operating men and industrial engineers have known for a long time that operators



can "kill" a rate when production runs become larger. During World War II, for example, one airplane manufacturer discovered the last two planes in a production run of 1000 planes took 90% less time to produce than did the first two planes; in other words, operators were turning these planes out at the end of the order ten times faster than they did at the start of the plane order. To be sure, not all of this saving in time and increase in production was due to



For a more complete discussion of this topic see the writer's earlier article, "The Importance of Learning Curves in the Development of Job Shop Production Standards", MILL & FACTORY, May, 1949.



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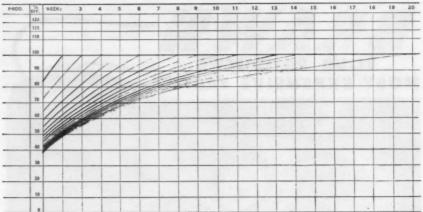
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PLACE NOTCH ON CURVE HERE

LEARNING OR SKILL CURVES. Production figures corresponding to efficiencies are recorded in the column marked "Prod." Expected production levels for any week may be ascertained by following each curve back to the week under consideration. Thus the average production or efficiency for a job requiring five weeks to learn (i.e., reach 100% incentive efficiency is 58% the first week or 82% the third week. These production and/or efficiency values are reproduced for easier reference in Table 1.

increased operator skill and effort. But there is a tremendous amount of muscle conditioning and eye-hand co-ordination that just begins to manifest themselves when the typical week long job is about finished; thus when a shortrun job moves back into the shop, much of this acquired muscle conditioning and skill is captured and put to use especially if the job moves back shortly after the initial run and in considerable quantity.

The effect of practice and repetition of any manual job is shown by the learning or skill curves shown in Figure I.⁵

Thus it is noted from Table I that a job requiring considerable dexterity might take 20 weeks (or longer) to get up to top performance. If a work standard of, say, 37 units an hour is set on such a job (just enough to enable the operator to earn his incentive bonus the first week), normal operators at the end of 20 weeks will be earning 270% of their anticipated earnings.

Many industrial engineers recognize this progressive skill phenomenon and will anticipate it to some extent by setting a standard which initially seems "tight." But there are very few industrial engineers who will under the conditions just outlined have the courage to set a standard of, say, 100 units an hour—over 2½ times as many units as the typical new operator averages the first week. So the experienced engineer will temper his thinking with

The writer wishes to acknowledge his indebtedness to Mr. Lyston Persing for much of the learning curve material contained in Figure I.

Table I. Progression Efficiencies for New Operators or Old Operators Starting New Jobs

Key: Column (a) below is the estimated time it will take a new operator to achieve 100% incentive performance. This estimate is based mainly on past experience in breaking in new operators on similar jobs. Where learning time is a factor in job evaluation plans, this estimate is arrived at by the combined judgments of local industrial engineers and foreman. Learning time estimates are not nearly as critical or important as work standard estimates; wide variations in these estimates may, therefore, be tolerated without corresponding errors in anticipated operator efficiencies.

Column (b) is obtained from values derived from the curves shown in Figure I. Example: To find out where an operator should be (on a job requiring 10 weeks to learn) during his fifth week, look down column (a) to 10 and across to Week 5 and you get 77%; thus if the inventive work standard on this job was 100 pieces an hour, performance of a potentially normal operator would be 77 pieces per hour (a little more than this at the end of the fifth week and a little less at the start of the fifth week).

(a) Learning Time in Weeks	Productive Efficiencies Corresponding to a Particular Week (in percentages)																			
	1	2	3	4	5		7			Week 10 11		12	13	14	15	16	17	18	19	20
1	100																			
2	85	100																		
3	73	97	100																	
4	64	78	90	100				-												
5	58	71	82	92	100															
8	54	86	76	85	93	100														
7	51	62	72	80	88	94	100													
	48	60	68	76	83	90	95	100												
9	46	58	65	73	80	87	92	96	100											
10	45	56	63	71	77	83	88	92	96	100										
11	43	54	62	68	76	81	87	90	94	97	100									
12	42	53	61	67	74	79	84	88	92	95	97	100								
13	41	52	59	88	72	78	82	36	90	93	95	98	100							
14	41	51	58	65	71	77	81	84	88	91	93	95	98	100						
15	40	50	57	64	70	75	79	82	86	89	91	93	95	98	100					
16	39	49	57	63	69	73	78	82	84	87	89	92	93	96	98	100				
17	38	48	56	62	68	72	77	81	83	86	88	91	92	94	96	98	100			
18	38	48	55	62	67	72	76	80	82	85	87	89	91	93	94	97	38	100		
19	37	47	54	61	66	71	75	79	82	84	86	28	89	91	94	95	97	98	100	
20	37	47	54	61	66	71	75	78	81	83	85	87	88	90	93	94	96	98	98	100

"selling" considerations and other intangibles. He will usually set a standard on a job of this kind of around 54—43 per cent above the prevailing average for new operators (or old operators doing entirely different work).

Grievances may be filed and pressure builds up to loosen the standard so that the operators can "make out." Let us assume the local industrial engineer holds his ground and gets support elsewhere for his position. But at the end of 20 weeks the works manager, superintendent, and the personnel manager are all wondering why this group of operators are making nearly twice as

much as their anticipated earnings rate. And the Union, of course, usually has a short memory on such "tight-loose"

sequences.

What To Do? The "subsidy" plan provides for this progressive skill (and speed) on longer running jobs. Such a plan enables the industrial engineer to go the full limit of what he considers a fair standard on a job. The subsidy plan, as the name implies, subsidizes or handicaps the new operator by an amount which will enable him "to make out" on the job—up to the end of the learning time.

Example: Assume a certain incentive job which has a standard of 100 units an hour and which is supposed to yield \$2.00 an hour. Assume further that this job takes 15 weeks before normal performance is reached. The subsidy plan would pay new operators on this job 2c per unit plus \$1.20 an hour the first five days on the job (see Table I); or plus \$1.00 an hour the second five days they are on the job; and so on up through week 14 when the subsidy would drop to 4c per hour.

Short-Run Standard. There is, of course, a quicker method of handling the short-run long-run incentive problem. It is the method of setting a standard on the short run job that will just yield the incentive earnings and having a tacit understanding that the piece rate on the job will hold good only for that particular production run (of, say, 4,000 units). Thus, in the foregoing example, a piece rate of 5.4 cents per unit (instead of 2c) would be set on this shortrun job. Suppose this job returned within a few weeks for a run of 8,000 units; then a price of 4.27 cents per piece would be set (\$2.00 divided by 47).

Because this rate of 4.27 cents is well under the former rate of 5.4 cents there

is, of course, the danger of being labelled "rate cutter" (or even "chisler")—unless both verbally and in writing each rate is tied in with specific production quantities. This may be difficult to understand and hence to "sell." For these and other reasons the writer prefers the subsidy plan outlined previously.

End of part 10

Strength and Resistance of Metals

By John M. Lessells. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. Price \$10. 450 pp.

The aim of this volume is to impart information on the behavior of metals under stress as it has been revealed by numerous workers in the field of design engineering.

Contents of the book, by chapter headings, are as folows: Tension; The Elastic-Stage Modification; Tensile Properties at Elevated Temperatures; Hardness; Impact; Fatigue—Normal Conditions; Fatigue—Controlling Factors; Fracture of Metals; Strain Hysteresis; Mechanical Wear; Theories of Strength and Working Stresses. These chapters are followed by a section devoted to problems and tables.

Machine Shop Operations and Setups

By Harold W. Porter, Charles H. Lawshe, and Orville D. Lascoe. Published by the American Technical Society, 846 E. 58th St., Chicago 37. Price \$5.50. 397 pp.

This book is designed to meet the specific requirements of modern instruction in machine shop techniques.

Written in the universal language of the machine shop, it conducts the learning reader on a detailed inspection of every important aspect of machine shop work. It is completely illustrated.

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Indexing Die Pierces Over 3000 Holes In Dryer Part

By Ivan W. Peters, Chief Die Design Engineer Whirlpool Corporation St. Joseph, Mich,

CLOTHES dryers have become a large item in the mass production of home laundry equipment by the Whirlpool Corp., St. Joseph, Mich. Among stampings used in such equipment is the circular rear plate of the dryer drum. This stamping, shown unpierced at the right and pierced with 3,240 holes at the left in figure 1, requires these perforations for the flow of hot air and vapors in the drying process.

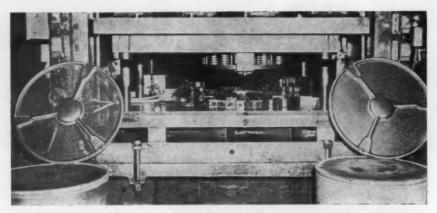
If a disc cut from perforated steel sheet were used, it would require a superimposed hub, spokes and rim for stiffness and proper support. Better production economy and other considerations make it desirable to produce the part as a one-piece stamping that is first blanked and embossed to form the stiffening portions. It then remains to pierce holes through the three flat portions bounded by spokes, rim and hub. This piercing is done in the die shown in figure 1 and closeup in figure 2.

Holes produced in piercing the 0.041-

Circular back plate, first embossed to form spokes and rim, is put through press that makes 18 hits in each of which 180 holes of 3/8-in. dia are produced in steel 0.041 in. thick.

in. steel are % in. in diameter and stock only 1/8 in. wide is left between adjacent holes. To pierce all of the holes at once would be difficult and require a very heavy press, hence an indexing die is employed and holes are pierced successively in 18 segmental areas, using 180 punches and 18 strikes per piece, with indexing between strikes. There are thus only 180 punches to keep in condition and the power needed per stroke is moderate, the work being done in a 150-ton straight side press.

There are three locating holes, pierced when embossing is done in another press. These holes insure proper



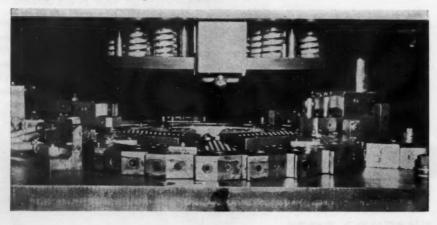
1. 150-ton press equipped with an indexing mechanism that moves the embossed blank, right, in 18 successive angular motions between strikes in which holes are pierced. A pierced stamping appears at left.

location for the successive indexings, which are equally spaced within each sector but are longer where indexing involves jumping a spoke in passing from one sector to the next one. Indexing is done by rack and pinion operat-

ing through a ratchet whose teeth can be seen around the dial in figure 2. Indexing stops when a button on the lever, left in figure 2, strikes a limit switch. Slugs are forced through the die and drop out below it.

The End

Closeup of the die used to pierce dryer drum back plates. Ratchet teeth are seen around the edge of the indexing dial whose motion is controlled by a rack and pinion. Lever at left stops motion when it trips a limit switch.



Transfer Press at Ford Feeds Itself, Checks and Corrects Mis-Feeds

BY feeding itself, checking and correcting mis-feeds, performing eleven separate press operations, and by delivering up to 28 completed parts for a starter every minute, this press speeds production and cuts costs of manufacturing this stamping which was formerly die cast.

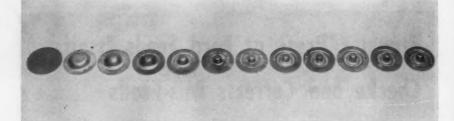
The transfer feed press was developed by the E. W. Bliss Co. for the Ypsilanti, Mich. plant of Ford. Besides the electric controls which guard against malfunctions special stacking and feeding device and an improved slide bar and finger transfer mechanism aids in the press' efficiency.

Although the transfer feed principle is over 60 years old, the method of feeding and transfering stock, or blanks, to this machine—the 1000th such press built by Bliss—is modern and up-to-date. Two cams and yokes attached to the main crankshaft drive the specially-designed automatic transfer feed mechanism. A plunger with a rubber vacu-

- uses 11 of 13 stations
- makes 28 starter brush end plates per/min.
- press takes five inch blanks, .090" low carbon open hearth steel
- special stacking and feeding device
- improved slide bar and finger transfer mechanism

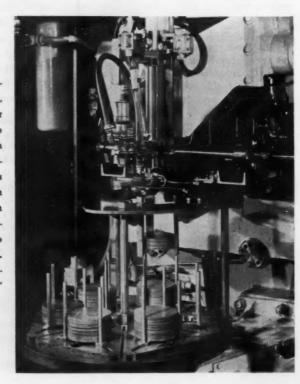
um cup descends to pick up a pre-cut blank. It rises to deliver the blank to the fingers. If the plunger does not deliver the blank to the fingers a limit switch stops the press. As the supply of blanks is exhausted, a limit switch at the lower end of the plunger stroke is tripped and an elevator pushes a new stack of blanks into the feed position. When the elevator descends it trips a switch that starts a motor and turns a six-station turret to the next full station of blanks. If a new supply of blanks does not come into position, a microswitch stops the press.

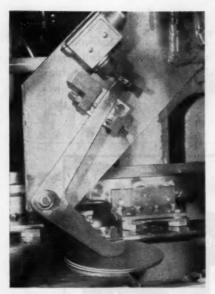
Another micro-switch in the transfer feed line prevents double blanks from reaching—and possibly ruining—the dies and damaging the press. If two



The transfer feed press uses 11 of the 13 stations to make up to 28 starter brush end plates every minute. The press takes a five-inch blank, puts it through six successive draws, flanges it, irons a 34" cup, restrikes the flange, pierces ten tiny holes, lances four locating tabs and trims the part to final diameter. The tolerance range throughout is \pm or -0.005", with \pm or -0.0005" held on one surface.

The specially-designed automatic feed mechanism, vital factor in any transfer feed press. Note that one load of blanks has been picked up from the six-station turret below. This unique feeding mechanism not only maintains a high rate of production but it assures positive protection to the die and the press itself. Blanks are 0.090" low carbon open hearth steel, 5" in diameter.



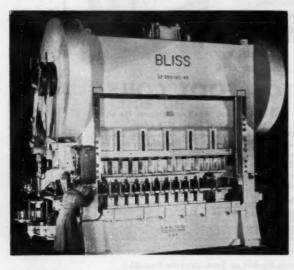


blanks stick together they trip this switch and actuate a solenoid which opens a trap door. Both blanks fall through and the press continues uninThe last of five safety sentinels is this feeler and micro-switch. When two blanks stick together and feed into the press, they lift this feeler, close the micro-switch and actuate a solenoid, which opens a trap door in the press bed. The blanks fall through, the door closes and the press goes on uninterrupted.

terrupted. In addition to safety, this device becomes highly important in maintaining production schedules. Compare the loss of only a single part to the loss of 28 parts for each minute if this device had shut down the entire press.

An equally important feature of the press design is the flexibility of the feed and transfer mechanism to accommodate similar type stampings that require successive or progressive steps or operations.

The press, built to J.I.C. specifications, is of straight side double crank



The transfer feed press is put into motion by its designer, Chief Engineer Arthur Schloz of the E. W. Bliss Company's Toledo Division. The press is of straight side double crank design, 120" x 48" bed. single geared with twin drive. The gears are totally enclosed and immersed in an oil bath. Driving power comes from a 50 hp adjustable motor. And a high speed single disc air clutch automatically compensates for wear and allows easy replacement of the linings. design, with a 120" x 48" bed, single geared with twin drive. The gears are totally enclosed and immersed in an oil bath. Speed can be varied from 14 to 28 stampings per minute by means of a 50 hp adjustable motor. Cam-actuated

knockouts in the individual slides accommodate various shell heights. The high speed single disc air clutch automatically compensates for wear and allows easy replacement of the linings.

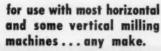
The End



Presenting...

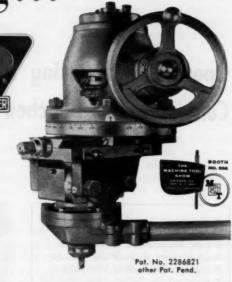
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cutter at any angle in the vertical plane, up to 15°, either side of center. Easy-to-read graduations make setting to a precise angle a very simple operation.

Operation of Boring Machine Controlled by Punched-Tape

- electronic signals regulate travel and cutting action
- tape prepared in five minutes
- changeover done in 30 minutes
- machine holds close tolerances
- accuracy is better than plus or minus .0005 in.

THE punched-tape principle of automatic operation has been applied to a precision boring machine used in the production of instrument gear trains.

A system worked out by Minneapolis-Honeywell Regulator Co. includes a standard four-spindle Ex-Cell-O precision boring machine modified with built-in electronic controls and circuitry and a tape "reader" housed in a specially-built control cabinet. This represents the first application of tape-controlled principles to a precision boring machine.

Hold coordinates and feed instructions are punched on the tape by a perforating machine similar to a typewriter. Electronic signals from the tape



Operating instructions are punched on a tape and fed through the "reader" housed in the specially-built control cabinet. Electronic signals from the tape, shown being inserted in the "reader" by Honeywell's automation director John Rudolf, regulate the boring machine's operation. The ten control knobs (seen beneath Rudolph's hand) adjust linear travel of the cross slide and rotary motion of the holding ring for manual operation.

regulate the linear travel of the boring machine's hydraulic cross slide and the rotary motion of a specially-designed holding fixture mounted on the cross slide.

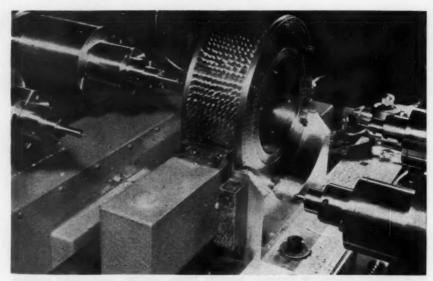
Early studies indicate that it is ideally suited for medium-sized production lots. Tooling and set-up costs are substantially lower than for punch press piercing dies or drill ream jigs and operating costs are less than for jig borers.

Tape preparation requires approximately five minutes per hold and complete changeover from one part to another can be accomplished in about 30 minutes. To set up automatic operation, the proper adapter ring is attached to the rotary fixture, cutting tools are mounted in the four spindles and the punched tape is placed in the reader of the control circuit. After inserting a blank piece in the fixture, the operator merely presses a button to initiate the automatic tape-controlled cycle. After the machine has "read" the complete strip of tape, it automatically stops to permit removal of the finished part.

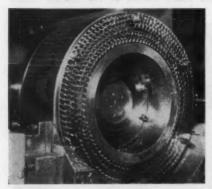
Designed for boring shaft holes in gear plates in which the center-tocenter hold tolerances must be tight to prevent binding or backlash, the machine is adaptable to a variety of hold patterns and sizes.

This is an overall view of the tape-controlled automatic boring machine. It consists of a standard four-spindle Ex-Cell-O precision boring machine (upper right) modified with built-in electrical controls, circuitry, tape "reader" and manual controls housed in a specially-built control cabinet (left). In the foreground an operator uses a perforating machine, similar to a typewriter, to punch hole coordinates and feed instructions on the tape. When placed in the "reader" of the control unit, the tape regulates linear travel of the machine's hydraulic cross slide and the rotary motion of the holding fixture mounted on the cross slide.





The loop plastic tape sends out electrical impulses to regulate the linear travel of the machine's hydraulic cross slide (lower left) and the rotary motion of the holding fixture (center) mounted on the cross slide. To set-up automatic operation, the proper adapter ring is attached to the rotary fixture; cutting tools are mounted in the four spindles; the tape is placed in the "reader." After the complete tape has been "read" the machine automatically stops to permit removal of the finished part.



This new tape-controlled boring machine is designed for boring shaft holes in gear plates in which center-to-center hole tolerances must be tight to prevent binding or backlash. Holes of various sizes have been machined in the part shown above. The part is held rigid in a rotary fixture.

Different piece parts can be handled merely by changing the adapter ring and inserting the appropriate tape. Where a small number of special plates is needed, the machine can be manually operated by adjusting 10 knobs to control linear travel of the cross slide and rotary motion of the holding fixture. Manual control knobs are located in the control cabinet.

In either manual or tape-controlled operation, coordinate information is fed to the machine in increments of .0001 inch over the eight-inch linear range and .01 degrees over the 360-degree rotary range. Accuracy is better than plus or minus .0005 inches.

The End

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- Reduces cost of installation and maintenance of bearing and gear box seals.
- Eliminates the need for many smaller lubricators and complex piping systems.
- 6. Pressure switches and liquid level controls automatically actuate alarm system or stop machine a) when oil supply reaches a pre-selected low level, b) when air pressure fails, c) when excessive pressure develops in oil tank.
- Solenoid valve starts and stops the Micro-Fog Lubrication system as the machine is turned on and off.

- Maximum flexibility in control of Micro-Fog: two high capacity lubricator heads may be used simultaneously or individually, depending on fog requirements; oil feed regulated by applied pressure over a wide pressure range.
- Three 2" Micro-Fog outlets may be used separately or in combination to facilitate connecting and routing of distribution piping. Air inlet is ½" pipe size.
- Rate of oil feed visible through sight feed dome on each lubricator head.
- 11. Oil gauge on tank visually indicates oil level.
- Automatic-Drain Filter removes moisture and solids from air line, drains collected moisture automatically, prevents contamination of oil supply.
- 1" conduit connection serves centrally located water-tight junction box.

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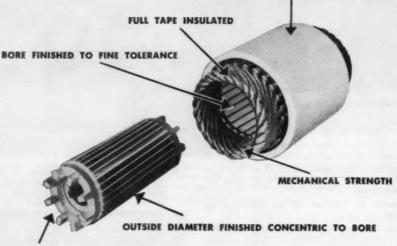
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MACHINE and TOOL BLUE BOOK



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Shaft Centering at the Cut-Off Saw Eliminated Centering Machine Operation

By C. T. Bower

There are certain advantages to be obtained from using the portable tool described here. The tool is intended for centering the ends of bars in readiness for mounting between lathe centers for turning. Instead of taking the cutoff bars to a centering machine, the tool is applied to the bar whilst being cut off in the power hacksaw. The handling of the cut bars for transportation to the centering machine is avoided and the centering machine itself is eliminated.

Labor is saved by the tool; it eliminates the need for a centering machine operator and the labor needed to transport the shafts to it. The tool also enables the idle time of the saw operator to be employed profitably by drilling the center holes whilst the bar is being cut off. The shafts travel direct to the lathe on which they are to be turned, from the saw, without side-tracking them to the centering machine.

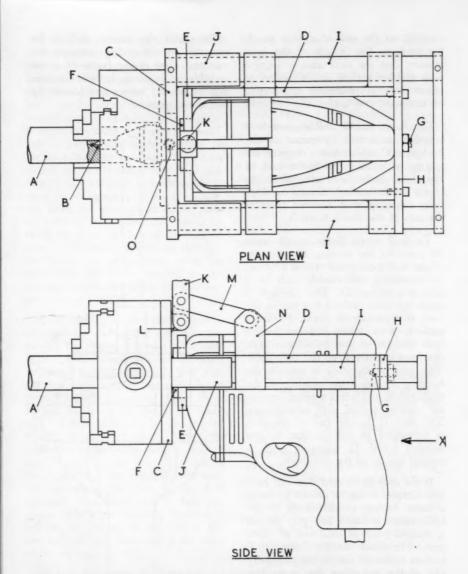
Ordinary standard drilled center holes are produced by the tool and are perfectly suitable for many turning

Portable tool provides these advantages:

- ordinary drilled center holes produced
- eliminates centering operator
- shafts travel direct to lathes
- both ends centered during sawing

operations performed on black or hotrolled bar stock.

Details of the portable centering tool are illustrated in the drawing. It will be seen that stock parts have been used in its construction. The means for locating the tool on the bar A is a standard three-jaw self centering chuck. The rotation of the center drill B is by means of a standard portable electric drill of ¼ in. capacity. The drill size happened to be suitable for a range of bars up to 1 in. diameter and it was considered that the use of a larger electric drill would only increase the weight of the tool and would impede its use. For larger bars, a portable tool incor-



porating a $\frac{1}{2}$ in. electric drill is being designed.

The tool is mounted on the bar end projecting from the saw vice, by closing the chuck jaws on to it. The advantages of using a three-jaw chuck are its reasonable first cost and the fact that it will centralise itself ac-

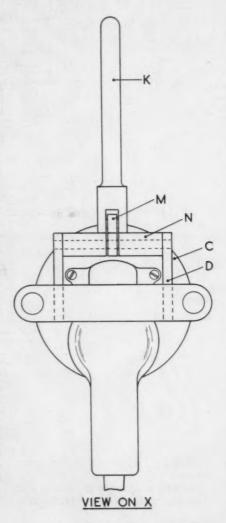
curately on the end of a very rough bar surface. The length of the jaws ensures that the drill axis is aligned with the bar axis so that a concentric center hole is produced, irrespective of unsquare cuts across the bar end.

Chuck and electric drill are assembled together as a unit by means of the backplate C which has a register engaging with the recess in the back of the chuck body. It is secured to the chuck in the normal manner by three bolts engaging with screwed holes in the rim of the chuck body.

To drill center holes, means must be provided for feeding the rotating center drill axially and this is achieved by mounting the electric drill in a sliding carriage, D. The carriage is made up from welded flat bar in the form of a rectangular frame. The front plate E of the frame is bored with a hole suitable in size to accommodate the front register F of the drill body. This part of the body is actually the housing for the front bearing of the drill spindle and forms a useful location for various special drill attachments. The rear, or handle end of the drill is supported in the carriage by the pointed screw G engaging with a conical dimple in the drill body.

If the drill to be used does not have this dimple, it can be drilled by using a lathe. Mount a drill chuck in the lathe tailstock barrel and grip therein a straight piece of drill rod or silver steel. The chuck on the electric drill is then tightened on to the projecting end of the rod when the center line of the drill will then be on the lathe center line and the dimple can be drilled with a drill mounted in the headstock chuck.

To enable the electric drill to be mounted in the sliding carriage, the rear end plate of the frame H is detachable; it is normally held in position by headed screws and located by two dowel pins.



A slide for the carriage is in the form of two cylindrical steel bars, I, and blocks bored to engage with the bars are welded to the carriage frame. The slide bars are mounted on the chuck back plate by fitting into a pair of tubular supports, J, welded to the back plate. It might be mentioned that when building up such items as the carriage or the back plate by welding, all welding should be completed before final machining is attempted. It is advisable to treat the weldment as if it were a casting. Parts can be rough machined prior to welding, but allowance should be made for final machining to accurate size. In the case of the sliding carriage, the blocks for engagement with the slide bars should be welded to the carriage before the holes for the bars are machined in line.

Axial feeding of the center drill is obtained by sliding the carriage containing the electric drill along the slide bars. As a substantial end pressure is needed to feed the center drill into the bar end, a lever arrangement is provided. The operating lever is at K and has a central slot at its lower end which straddles the lug, L, welded to the chuck back plate. The lever pivots on a pin intersecting it and the lug. Higher up the lever is a second hinge pin on which is pivoted the link, M, connecting the lever to the drill carriage. The other end of link engages with a pin running through a bridge, N, straddling the top of the electric drill and anchored to the sides of the carriage frame.

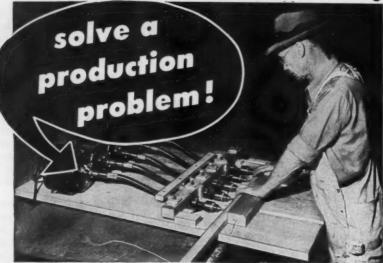
To feed the center drill forward into the bar end, the lever is also pushed in the same direction. Since the lever is at the top, the pressure applied also tends to counterbalance the weight of the whole centering tool and reduces the sagging strain on the chuck jaws.

On the electric drill illustrated, the chuck is of a simple type which is tightened finally by means of a socket head screw, O, running radially through the shank. When the carriage is pulled back to its outermost position, this screw is exposed and the chuck can be released for drill changing. It is admitted that the chuck is not very accessible since it is housed almost completely in the central bore of the self-centering chuck. However, drill changing is not very frequent and it can be accomplished without much fumbling.

Drilled depth of centers can be controlled by setting the self-centering chuck front face in line with the bar end. Projection of the drill from the drill chuck can be preset and the length of carriage feed is controlled by the feed lever making contact with the backplate at the end of its stroke.

When using the tool, the operator starts the saw-blade on its journey through the bar and then mounts the centering tool on the overhanging end by tightening the self-centering chuck in place with a suitable key. The drill is switched on and the center drilled. after which the tool is removed. If the severed bars are stored in a rack horizontally and at working height, the tool can be mounted on their second ends and the centers drilled therein. In cases where the bar is severed by the saw before the operator has time to center the second end, the bars can be stored in a rack so that they may be drilled when time is available. The bars are pulled out endwise from the stack in turn so that the tool may be mounted on them.

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THE H. T. Hunt Co., of Binghamton, New York, took a contract to make several thousand newspaper racks. One of the principal production problems involved in this job was the drilling of thousands of holes-which were at first drilled individually-using a templet. This method was inefficient, costly, and time consuming.

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MACHINE and TOOL BLUE BOOK

Special Purpose vs. General Purpose Machines

By Perrin G. March, III, President

The Cincinnati Shaper Co. Cincinnati, Ohio Director, National Machine Tool Builders' Assn.

FROM the 6th to the 17th of next September, Chicago is going to be one of the busiest cities in the world.

For these are the dates of the Machine Tool Show, sponsored by the National Machine Tool Builders' Association, to be held in the International Amphitheatre and its newly added Exposition Hall, in conjunction with the Production Engineering Show to be held on the Navy Pier.

It is estimated that at least 200,000 executives in charge of operation, plant managers, designers, engineers, research and product development experts, and financial specialists concerned with problems of reducing manufacturing costs will attend these Shows. Already Chicago has reserved over 10,000 hotel rooms, and the city's traffic authorities are arranging preferred routes for expediting bus, taxi, and private car transportation from down town hotels, and between the Shows.

The production geniuses of America—and they are legion, because without them most manufacturing companies would be out of business—will come to Chicago to see what the nation's

machine tool industry has developed in recent years that may persuade them to replace old equipment now in their plants by new machines on display at the Machine Tool Show. They will also be vitally interested in the instruments, equipment, and accessories, contributing to greater productivity, which will be on exhibit at the Production Engineering Show.

At this point I could expand at great length about the incredible advances in the art of cutting and forming metal which reduce cost per part produced, and the many modern devices and mechanisms which facilitate machine operation and increase output. But that is not my purpose here, and all these things will be on display at the two Shows.

I want to discuss briefly a question which is puzzling many production engineers today, namely:

Should we buy a special purpose machine to do certain work; or should we do it on a general purpose machine?

Now that the word "Automation" is on nearly everyone's lips, some people may wonder whether general purpose machines will gradually be replaced with special machines. As the costs of labor and material increase, the natural tendency is to make every effort to produce parts in the most economical manner. Normally, we think of special purpose machines in conjunction with very high production, but they are equally important for producing products that cannot be economically made on a general purpose machine.

There are two general types of special purpose machines:

- 1. Those for extremely high production:
- Machines for producing a product that cannot easily be made on a standard machine.

In the first category are such machines as multiple station transfer machines for drilling, broaching, tapping, milling or boring such parts as cylinder blocks, transmission housings, crank shafts, and many other similar parts. Many special machines are also built for doing single operations on all types of parts requiring high production. There is no doubt that machines for such operations will quickly pay for themselves. In many cases the machines are absolutely necessary in order to meet production schedules and to keep down costs to stay in the competitive race.

The second category includes such special purpose machines as automatic tracer controlled milling machines, airplane skin millers, huge stretch benders for skins, the elephant-size presses and tools of all kinds. Many of such special purpose machines are built simply because there is no other way of producing the desired parts economically. For example, to produce a large air-

plane or automobile draw die without a large tracer controlled three-dimensional milling machine would be an almost endless task, if it were possible at all. Smaller similar machines are used for making dies for refrigerators, stoves, TV sets, and hundreds of other items that we use in our daily lives.

The field of general purpose machines, can also include two groups.

- Machines used for maintenance, toolroom, one of a kind, or low production jobs.
- 2. Machines for medium and relatively high production jobs.

In the first group are machines such as standard lathes, drill presses, shapers, milling machines, planers, and grinders. With the increasing use of special machines and special tooling, there is a good demand for standard machine tools because they are needed to make



"This little booklet tells you how to run it, and the other manuals show what to do if something goes wrong with the machine!"

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Many special machines today are made with fabricated steel parts in order to save the time and expense of making patterns. This necessitates the use of standard fabricating machines such as flame cutting machines, shears, bending rolls, press brakes, automatic welders, and those of a similar nature.

The greatest use for general purpose machines is, of course, for medium and relatively high production jobs. It is generally accepted that standard machine tools equipped with relatively low cost special tooling are best suited for medium quantity production jobs.

Many standard machines are built for relatively high production. Some of these are automatic multiple spindle screw machines, automatic forging machines, multiple station punch presses, and drilling machines with multiple spindle heads.

Great progress has been made in the past few years in adapting general purpose machines for relatively high production jobs. One of the outstanding examples is the use of tracer controls on standard shapers and engine lathes. Parts are being machined in from one-half to one-third the time previously required. Standard grinders, gear cutters, drilling, milling, and broaching machines have been provided with automatic feeding devices.

Whether or not to use a special machine designed for a specific job or



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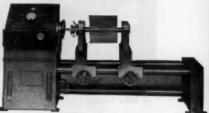
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The Gishalt Type 3U Balancer shown here is capable of balancing rotating parts or assemblies weighing from 50 to 1000 pounds. Other sizes and types are available to answer any balancing problem. Gishalt Balancers can also be furnished with correction equipment to meet your own specific requirements.



to use a standard machine with automatic feeding devices requires very careful analysis. The special machine must pay for itself before the part it is making becomes obsolete due to a design change. The total cost usually must be charged against the part. Some special machines, however, are built with quite a number of standard components. If there is a moderate change in design, the individual standard units on such

a machine can often be relocated.

Standard machines with special loading devices are usually much lower in cost. Sometimes two or three such machines will be more economical than one highly special machine. If the one special machine requires servicing, or a tool change, production stops. If one of the standard machines is shut down, production can still be maintained.



Shown: Checking compound angles with tooling ball mounted in lathe fixture.

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MACHINE and TOOL BLUE BOOK

Another consideration is that sometimes a special machine must run only a part of a day or week to turn out the parts required. With standard machines the tooling can be changed to handle another job. This procedure has been followed for many years in the metal stamping industry on high production jobs. Automatic feeding mechanisms in general have been somewhat

easier to apply to punch presses than to machine tools.

The ingenuity of machine tool designers in developing special feeding devices will make it possible to produce different sized parts on the same general purpose machine. This is a big advantage to the manufacturer who must produce many different models of his product or make a model change



every year. The indications are, therefore, that there will be an excellent market for standard purpose machines.

The question to which every production man must obtain the answer is, "What type of machine is best adapted to the particular work in my plant?"

The way to get this answer is to visit the Machine Tool Show.

There the manufacturer may see in operation, and compare, the various makes and types of machines that may be appropriate for replacement requirements.

Over 140 companies will have the latest models on display. The Machine

Tool Show will constitute the largest single exhibit of machine tools ever held under one roof. Practically all of the more than 400 machine tools will be on exhibit. The machines shown will range in size from that of a small desk to that of a two-story frame house, and in weight from a few hundred pounds to well over fifty tons.

The Machine Tool Show will provide an opportunity, such as is seldom afforded, to see both special purpose and general purpose machines at work, and judge for yourself which type is most desirable for the operations in your plant.

The End

New Cincinnati Milling Hydrospin Machine Squeezes Cold Alloy Steels Into Shape

A giant new machine tool that squeezes cold alloy steels into desired shapes and that can cut in half production costs on many difficult-to-form aircraft components has been installed in Solar Aircraft Co's. San Diego plant.

The unit is known as a hydrospin machine, and is the first of its type in the United States. It is valued at about \$100,000, weighs 32 tons, and was shipped to Solar in two freight cars from Cincinnati, O., where it was built by Cincinnati Milling Machine Co.

In the Hydrospin machine, a blank metal disc is rotated at high speed. As it spins two heavy duty steel rollers force the metal disc into the desired shape, while the rollers advance along a preset course. The machine is semi-automatic—once the adjustments are set by an operator, various steps in the work cycle proceed automatically, except for loading and unloading. The

machine is almost completely hydraulically controlled, giving it tremendous power plus unusual flexibility. The

J. A. Logan, chief production engineer of Solar Aircraft Company's San Diego plant. examines a spun metal cone produced from a simple disc of metal like the one he is holding.



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Hydrospin is the first machine of its type to embody the automatic features plus the ability to produce contoured shapes.

Solar will use the Hydrospin machine to manufacture jet engine and other high temperature parts, such as jet exhaust cones. Numerous forming, welding and machining operations on the cones can be eliminated through use of the Hydrospin. For example, one part is now made from a hemispherical casting with additional machining and welding, for a total cost of \$40. On the Hydrospin the entire cost would be \$15. Substantial savings result from both lower material and labor costs, Solar production engineers said.

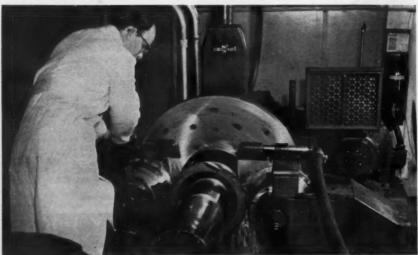
In operation the Hydrospin employs two opposed rollers which force the material being worked to cold-flow onto a rotating mandrel. Pressure comes from four 25 ton hydraulic cylinders operating at 2 at 2500 pounds per square inch and 2 at 1000 pounds per square inch. Stock up to 42 inches in diameter can be handled, and the machine has

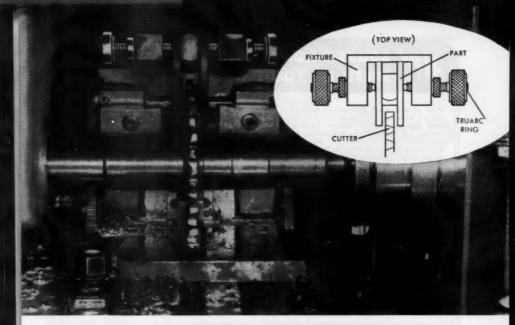
successfully formed inch-thick mild steels and three-quarter-inch thick stainless steel. At Solar a five-ton bridge crane services the machine.

A major use for the Hydrospin is the production of dome-shaped contoured parts. In the past they have been fabricated in two sections and welded together, requiring both special dies and fixtures. On the Hydrospin they are simply formed from a blank disc. On many parts, only one-fourth as much material is required to Hydrospin the part as to produce it from a forging, and production time is much less.

Another advantage of Hydrospinning is that parts turned out are stronger, with greater resistance to fatigue failure, than components made by conventional methods. When metal is hydrospun, it undergoes a shear deformation, greatly elongating the metal's grain structure. The deformation results in work hardening of the metal, and an increase in tensile strength. The resulting surface finish is excellent and gives part high fatigue resistance.

This new machine tool, made by Cincinnati Milling Machine Co., is a Hydrospin machine.





... at North American Aviation, Inc., Los Angeles Division:

Vlier Torque Thumb Screws eliminate quesswork when supporting parts against drill or mill thrust

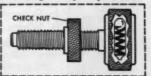
revent inaccurate machining which Iways occurs when work is not roperly supported ...

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many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed-Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN THE FOLLOWING SIZES: 3-16, 1-4, 5-16, 3-8, 7-16, 1-2, 5-8, 3-4, 1"

STURDY BROACHING SERVICE, INC.
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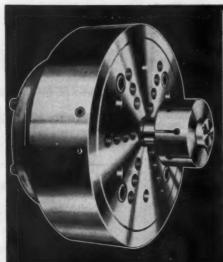


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Reasons for You to get the Facts on SPEEDGRIP CHUCKS

- 1. They increase production.
- 2. They give greater accuracy.
- 3. Set-up time is shorter.
- 4. They are safer to operate.
- 5. First cost is low.
- 6. Maintenance cost is low.
- 7. Design is simple.
- 8. Guaranteed to do the job.
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Speedgrip Precision Internal Chucks will save you money on second operation work.

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SPEEDGRIP CHUCK 820 N. WARD STREET

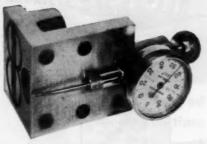
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MACHINE and TOOL BLUE BOOK

F magnets can solve your tooling problem

THEN

Cerro Alloys can fasten magnets without press fits, set screws, etc., as was successfully done by the manufacturer of the "Magic Tool & Die Checker". For dependable results insist on genuine Cerro Alloys.



Bulletin Al gives the solution for many anchoring problems. Write today.

CERRO DE PASCO CORPORATION

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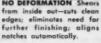
ACE DRILL BUSHING CO., INC. 5407 Fountain Ave. Los Angeles 29, Calif.

Write For Catalog D



NOTCH _ THESE ENDS WITH ONE STROKE OF PUNCH PRESS ARC-FIT TWIN NOTCH

NO DEFORMATION Shears



PERFECT "T" Joints for welding or brazing.

PRODUCTION NOTCHING Actual production time per pipe or tube end reduced to less than 3 seconds.

INTERCHANGEABLE

Punches and dies up to 2%" O.D. pipe or tube for STANDARD TWIN NOTCH. (Special units available up to 3" O.D.)



PATENT PENDING

AND DIE

Melrose Park, Illinois 1825 N. 32nd Ave.

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POWER SCRAPER Cuts Production Costs ...

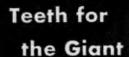
> One manufacturer was scraping flat pieces measuring 18 by 24 inches ... each piece requiring 5 hours to scrape by hand. An Anderson Power Scraper cut scraping time to 50 minutes! That meant a substantial saving in production costs and another happy Anderson customer. Let us help you estimate how much this portable, easy-to-use power scraper will save for you.

> > Today, Write for Bulletin 5-5

ANDERSON BROS. MFG. CO., Rockford, III.

5 HOUR JOB CUT TO 50 MINUTES

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job-engineered ... and on time

The tremendous power of America's metalworking giants is often focused at the simple tip of a cutting tool. ADAMAS tungsten carbide tool tips are the foundation for many of today's best production records. High-quality ADAMAS carbide grades are job engineered to fit both standard and special tool tip, die and wear part applications. Delivery is fastest in the industry.

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TUNGSTEN CARBIDE ®

ADAMAS CARBIDE CORP. . KENILWORTH, NEW JERSEY



Diamonds are a tool's best friend

Grinding keen edges on cemented carbide cutting tools can be tricky. The material is extremely hard and brittle...easily harmed by excessive Resinoid Bond Diamond Wheels heat. CARBORUNDUM's new B-7 grind unusually free and cool-re-

ing the carbide. Less pressure is duce the danger of checking or crackneeded to achieve accurate sizing to sharp edges. And CARBORUNDUM's last longer...deliver greatly increased close tolerances, and to produce razor-Diamond Wheels hold form better,

Company, Niagara Falls, N. Y. In tool life. Ask your CARBORUNDUM Distributor or salesman for free copy of booklet, "Grinding Cemented Carbides," or write The Carborundum Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

Through product quality and application "know-how"

MUDUNDUM MUDUNDUM

continually puts more sense in your abrasive dollar

MAKE GAGES LAST LONGE

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offered by Size Control Company as a service for

XDon't Force a gage into or over the part being checked.

*Don't lay gages on benches, machines or dirty surfaces.

*Don't clean gages in water, soluble solutions, kerosene or carbon tetrachloride - all cause rusting.

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We'd like to discuss your gage needs and have your gage orders. Our engineer ing representative are located in all principal cities Write or tela phone w

useful

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8½ x 11 reprints of this ad in three colors on heavy stock are avail-able at no charge for sting in your factory. our thousands of satisfied customers and friends.

Learn how to properly hold and use your gages. Fit must be snug and smooth. Make wooden, felt covered gage racks. Oil the felt surface. This helps to keep your gages clean.

Roll or twist the gages into the work slowly to get the proper feel. Check every gage against the master gages before using, at least once on every

shift and before returning to the tool crib. Include gaging expense as part of manufacturing budget. Quality product companies now do this.

. AND insist on all of these quality features when you buy new gages:

Reversible Plugs...enable you to cut off worn tips at each end — use new section exposed for six to eight times

• Entire Plug Surface Usable - straight untapered pieces provide uniform gaging surface over entire length - finish to 1.5 microinches RMS or less for maximum amount of wear life.

• Pin-Vise Aluminum Handle - positive locking; plugs can't slip. Easily loosened for replacing or reversing plug. Plug length adjustable for different hole depths.

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Special Hardening-plugs hardened throughout...enables you to grind down to smaller size...gives greater economy.

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The FISCHER No. 1 Oil Groover cuts a wide variety of grooves in bearings up to 8" in length and up to 5" inside diameter. A few simple settings permit you to cut continuous, relieved, straight or spiral grooves at any angle from parallel to perpendicular to the work. Grooves may also be cut in shafts, housings, etc.

This machine will slash grooving time and deliver continuous profitable production in your shop. It will pay to find out what it can do on your grooving jobs.

ESTABLISHED 1900 -

FISCHER MACHINE CO.

ELEVENTH and WOOD STREETS

PHILADELPHIA 7, PA.

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Inside SLOTTER

Makes cuts up to 8" inside edge of sheet. Sharp, clean burr-free cuts always assured. Cap. 16 ga. High strength aluminum alloy body; H.C.H.C. blades.

Throatless SHEAR

Make any cut—straight, irregular, curved. Exclusive design permits turning work any direction while cutting. 4 models—cap. to 3/16".

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New "SS" Series—easier cutting with compounded linkage. 3 models—cap. to 3/16"; trimming capacity to 5/16" mild.

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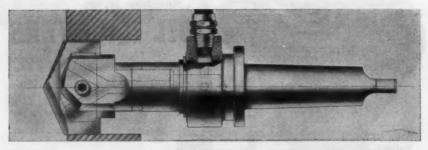
BEVERLY metal cutting SHEARS



Beverly SHEAR MFG. CO.

3005 W. IIIth STREET . CHICAGO 43, ILLINOIS

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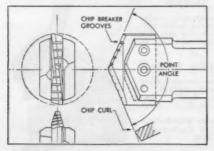


Reduce Costs with Gairing Spade Drills

For drilling large holes and holes in hard and tough materials, Gairing Conner-Type Spade Drills, in stock sizes from 1 to 5-inch diameter, offer many advantages. They drill from the solid, and keep on drilling without being retracted to clear them of chips. Their performance is based on the great strength of the assembled drills, and on the design of the drill point. Their economical use increases with their size, and is based on wide range of stock sizes and interchangeability in only eight sizes of holders.

Spade Drills Have Greater Strength

The spade drill below shows heavy cross sectional strength along a direct line between drill point and shank.



Compared to a twist drill, this design provides great resistance to end thrust (for better drilling from the solid), to torque (to lessen chipping and breaking through vibration), and to bending.

Drill Point Designed for Hard Work

Spade drill cutters are furnished finished ground with these features: small dead center minimizes end thrust, cutting angles (point angle and rake) provide better support of cutting edges, chip breaker grooves keep chips narrow, chip curls, ground parallel to cutting edges, break chips short.

A Rugged Tool for General Work

A rugged tool for all large hole drilling in tool rooms and tool and die shops and for shallow production drilling, where coolant can be applied in the conventional way, is shown at the left.

A Tool for Continuous Production

Oil hole drills, rotating or designed for the turret lathe, flush chips from the bottom of deeper holes on production work. Many such drills, like the one shown above with a special oil inductor holder, are made larger than standard for special applications.

Full data on standard drills and examples of deep hole drilling are shown in our Spade Drill Catalog. Write us, or call our representative.

THE GAIRING TOOL COMPANY

Tooling—Standard and Special

21228 Hoover Road

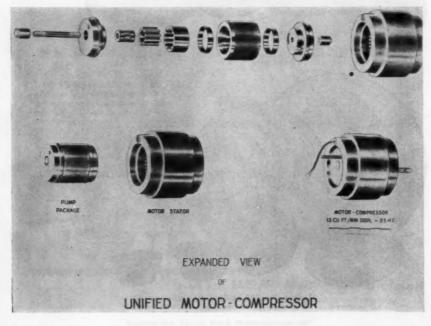
Detroit 32, Mich.



Epoxy Resin Solves Unusual Design Problem

An entirely new concept in compressor design has been made possible through the joint development work of Wetmore Hodges & Associates (Red-

wood City, California) and the Shell Chemical Corporation. By placing the actual compressor mechanism inside the electrical driving members, it was



Carbide grinding's

Norten Vitrified Bonded Diamond Wheels feature fast stock removal, high resistance to grooving and long service life. Typical Applications: production grinding of single-point carbide tools; grinding chip breakers; precision grinding of carbide tools, cutters, discs, gages, rolls, etc.





Norton Resinoid Bonded Diamond Wheels are made in two bond types — regular, for wet grinding and B6, for dry grinding. Each type gives extra fast cutting action and long wheel life. Typical Applications: grinding multi-tooth cutters; cutting-off damaged carbide tools; grinding threads from solid in carbide taps and thread gages.



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"CROWN JEWELS"

Norton diamond wheels bring unbeatable economy to your production

Backed by Norton's long leadership in development and manufacture, Norton diamond wheels are carbide grinding's recognized "Crown Jewels", with a royal reputation for better, lower cost grinding!

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NORTON: was first to introduce resinoid, metal and vitrified bonded diamond wheels ... does all its own sizing, grading and laboratory checking of diamonds . . . duplicates wheel specifications with constantly controlled accuracy, to assure you uniform top performance . . . brings you a complete line, covering every diamond wheel application in every field - stone, glass, ceramics, etc.

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is ready with quick deliveries of the diamond wheels you need for better, more economical carbide grinding. Ask him for the 142-page illustrated booklet, Grinding Carbide Tools, and the complete net priced Diamond Wheel Catalog or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

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possible to reduce over-all size of the unit to only one-quarter that of a conventional motor-driven compressor. Also, for the same capacity, the Wetmore Hodges compressor, invented by H. H. McAdam, has eliminated some 60 per cent of dead weight. It needs only 12 parts instead of 110, and is much easier to assemble. The originator foresees mass production costs substantially below those of conventional units.

Two main factors led to the success of this new idea. First, the gear-type compressor was designed so that the ring gear drives the inner pinion. Thus a positive seal is obtained at the back of each pinion tooth rather than the front. It eliminates fluid leakage past the tooth to permit the highest possible compression.

Second, since the stator also serves as the outer casing for the entire unit, some way of making it completely impervious to all types of fluids had to be found. Shell Chemical's Epon resins, suitably formulated and cured, are now used to impregnate the stator windings, effectively sealing and protecting them against moisture or chemical attack. As a result of this protection the entire motor-compressor can be submerged in liquids or gases without ill effect. It is leakproof at pressures up to 350 psi, and temperatures between -20 and 250 F.

While the present development is aimed primarily at the domestic refrigeration market, other fields could adapt this new product equally well. The unit's small size and light weight make it attractive as a submerged fuel pump for aircraft; as a liquid pump in guided missiles; for automotive air conditioning; and for down-hole sub-

merged well pumping. Where hazardous fluids need to be pumped, the Wetmore Hodges compressor eliminates the possibility of fire or explosion, while at the same time it avoids contamination. It may therefore be ideal for pumping radioactive materials, cleaning fluids, or petroleum fuels. It also makes a good vacuum pump.

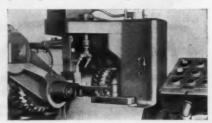
Duplex mill for bolt seat milling of connecting rods

Connecting rods are most economically produced if the forgings are made in one piece, with the cap forged with the shank. The cap must eventually be cut from the shank.

This machine cuts by circular saw the cap from the connecting rod at the crankshaft end. Simultaneously, the top and bottom bolt seats are finish milled. The single arbor on each head has a Triple-Chip circular saw blade between straddle milling cutters, which makes simultaneous cutting and milling possible.

The machine consists of right- and left-hand Motch & Merryweather B-7½ traveling milling heads mounted on hardened and ground steel ways. Each head has husky arbor supports for the saw blade and straddle milling cutters. The heads approach simultaneously, and the circle formed by the crank-end of the connecting rod is cut in half and milled from two sides simultaneously.

The part is located in the fixture by placing the machined pin end of the



connecting rod over a hardened and ground pin with hardened steel blocks providing location at the crank end where the saw cut and straddle milling is performed. Clamping is accomplished by a hydraulic cylinder over the top of the forging at the crank end. In removing the machined and split rod, the operator raises the shank end from the pin, pushing the cap into a chute for ejection at the front of the machine.

The geared milling heads are each driven by 5 hp motors. The electrical and hydraulic system is built to J.I.C. standards.

This machine illustrates combining operations, not only on one machine, but on a single spindle. Part size and change-over is accomplished quickly by using pre-set tool arbors and minor adjustment of the fixture locators. Designed and built by The Motch & Merryweather Machinery Company, 888 East 70th Street, Cleveland 3, Ohio.

Hartford special 8-station drilling & tapping machine

A product of The Hartford Special Machinery Co., Hartford, Conn., this single purpose drilling and tapping machine turns out 450 carburetor bodies per hour at 100% efficiency. Designed and built for a leading automobile man-

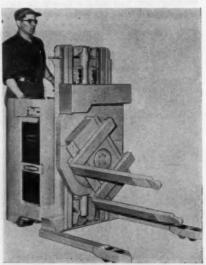


ufacturer, it is an eight-station, multiple spindle, dual loading transfer type machine with five drill units, two tapping units and an air hydraulic transfer mechanism. On it various drilling and tapping operations are performed, the parts being located and clamped at each station in previously machined valve holes. Parts ride free cn rails between stations.

Fork truck for use with automatic screw machines

A large manufacturer of business machines had a problem in their automatic screw machine department. Metal turnings are collected in tote boxes beneath the machine. As the boxes filled, it was necessary for a worker to reach beneath the machine for the tote box, place it on a floor truck, push it to the cutting oil collecting centrifuge machine and return the empty container for reuse.

The Raymond Corp., Greene, N.Y., solved this problem with a rider type fork truck for narrow aisle operation



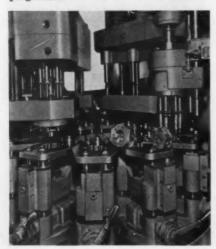
May, 1955

equipped with special hook type revolving forks. The truck is driven up to the machine, the fork hooks engage the box handles and pull it out from beneath the machine. The hooks are disengaged by lowering the forks which are then driven into channels welded on the bottom of the tote boxes and elevated for traveling. When the truck arrives at the centrifuge machine, the forks revolve dumping the turnings. The box is then returned to the screw machine for reuse.

Millholland 12-station vertical indexing machine

This newly designed machine has 34 spindles and operates at 31 seconds cycle time to produce 93 pieces per hour at 80% efficiency. The machine bed and columns are of welded steel construction well ribbed and annealed.

The Millholland Automatic Units used in this 12-station vertical indexing machine include two No. 5 Units mounted vertically, a No. 2 Unit mounted horizontally on a rapid travel slide, and an automatic lead screw tapper with reversing motor driving a 6-spindle tapping head.



A Millholland automatic unit is removing metal 80% of the total cycle time. This chip cutting efficiency is made possible by the distinctive design of the Millholland plate type cam, plus the action of the pneumatic counterbalance.

Drilling, reaming and countersinking operations are performed by a 22-spindle, high speed, pressure lubricated head mounted to the first Unit. Accurate boring operations are performed by a 5-spindle head mounted to the second Unit. The vertical drill units are powered by 10 HP motors, the tapper Unit by a 5 HP reversible motor, and the horizontal Unit by a ¾ HP motor.

The 12 holding fixtures are of unique design. Part requirements dictated location using self-centering horizontal Vees in combination with an up-acting clamp. These functions are actuated by a single handle operated through a small angle. The extremely compact design of fixture also contains register pins for all bushing plates. The 12 fixtures are mounted on an independently powered automatic index table with self-contained lubrication pump.

All machine elements are electrically synchronized, and arranged for push-button control. All electricals conform to J.I.C. Standards. Chip disposal is simplified. A ring mounted on the index table body handles chip disposal. Wiper blades rotating within the ring bring the chips to a removable pan.

Flame-plating gives aluminum wear-resistance of tungsten carbide

How to make a lightweight drive arm with high wear-resistance posed a difficult design problem to the Herman Nelson Division of the American Filter Company, Moline, Ill., manufacturers of aircraft heater mechanisms. Plastic inserts, high alloy precision castings, and machined high alloy forgings were considered, but high cost or weight made them impractical.



This forged aluminum drive arm for an aircraft heater mechanism is subjected to severe sliding abrasion and before Flame-Plating had a varying life of 100-300 hours. By Flame-Plating the wear surface of this part with tungsten carbide an unusual combination of high wear-resistance and lightweight was achieved. Service life is now rated at more than 1000 hours.

The problem was solved by using a forged aluminum part which had been plated with tungsten carbide by Linde Air Products Company's Flame-Plating process. In this manner an unusual combination of lightweight, low inertia, and high resistance to wear was developed. An unplated forged aluminum drive arm had an expected service life of 100-300 hours. After Flame-Plating this part easily exceeded the required 1000 hour mark. Another wear problem solved by Flame-Plating.

Flame-Plating was developed by Linde Air Products Company, a Division of Union Carbide and Carbon Corporation, for depositing a thin tungsten carbide coating on the surfaces of parts and many tools where extra wear-resistance is required. Most common metals can be plated. Because the temperature of the part being plated does not exceed 400 dg. F., the possibility of a change in the physical properties of the base metal is eliminated and reduces to a minimum the chance of distortion. For this reason, the process is

well-suited for use on finished or semifinished parts where the physical properties have been predetermined.

The tungsten carbide coating may be left in as coated condition (125 microinches rms) as in the case of the forged aluminum drive arms, or ground and lapped to a mirror-like smoothness (1-5 microinches rms) for such applications as plug gages.

Plug and ring gages, gripping dogs, turbine shaft seals, and core rods are a few of the current Flame-Plating applications where outstanding success had been recorded.

Largest electric furnaces use high efficiency reducers

In designing the largest electric furnaces ever built, now going into service at McLouth Steel Corporation's Trenton, Michigan plant, American Bridge Division, U. S. Steel Corporation, combined many new ideas in furnace building with the latest standard equipment. Two of the giant, 200-ton Heroult furnaces were purchased by McLouth as part of its current expansion plan.

Giant Heroult electric furnaces, built by American Bridge use seven standard Cone-Drive speed reducers for furnace tilting, raising and lowering electrodes and handling the lifting doors.



Because of the size of the units, many components had to be specially designed. A good example of this is found in the selection of speed reducers required to perform a variety of vital jobs on the furnaces. Seven Cone-Drive speed reducers are used on the furnaces, their selection being based on high capacity, smoothness, compactness, and the availability of standard models of the required rating.

The furnaces, with an inside shell diameter of 24½ feet, handle carbon steel heats weighing an average of 180 tons. Combined weight of furnace and heat is about 700 tons. To tilt this heavy load smoothly and accurately, a double reduction Cone-Drive double-enveloping speed reducer with center distances of 10 and 21.837-inches is used.

Capacity of the reducers and the smoothness of operation both have an important bearing on the overall continued operation of the furnaces. Minimum maintenance requirements are also a big factor in their selection.

Three 5 and 12-inch center distance double reduction units are used to raise and lower a large mass consisting of the mast stems, mast arms, electrode holders, electrodes, bus tubes and secondary cables over a speed range varying from 0 to about 7½ feet per minute. High acceleration rates are extremely important for maximum efficiency in furnace operation.

The drive mechanisms consist of an electric motor driving a Cone-Drive reducer with a drum on the output shaft on which the lifting cable is wrapped. Space was the governing factor and the Cone-Drive units were the only suitable reducers of the required capacity that could be accommodated in the available space.

Lifting doors also use the same dependable reducers. Thus, American Bridge is able to provide its customer with the highest standards of performance at the lowest cost consistent with the quality of the product through use of standard component parts.

15-station transfer machine uses standard machine units

Motch & Merryweather has recently designed and built a 15-station in-line type transfer machine utilizing standard machine units. The part processed, a refrigerator cylinder bracket, is produced from standard 3" x 2½" x½" hot rolled angle iron. Production is 380 pieces per hour at 100% efficiency.

The first station saws the angle iron to accurate length so that three equal length pieces can be discharged at the final station. The saw unit discharges the piece into a lateral conveyor for loading by index into the main straight line transfer machine. At the first machining station the angle iron section is milled on one face and one edge. From this station the part is moved into the first barrel-type turn-over fixthre holes. Following the drilling and station for milling the other face and edge.

The next station drills and reams three holes. Following the drilling and reaming, 12 holes are drilled and six holes reamed by a similar drill-ream set-up. The drilling and reaming are followed with a second barrel-type turn-over fixture which positions the parts for the end milling of seven holes. The milling, reaming and drilling stations are equipped with 15 h.p. way-type power units, with multiple-spindle heads.

At the last station, a saw head equipped with two circular saw blades cuts the stock into three completed pieces. All sawing, at the first and last stations, is performed accurately by Motch & Merryweather Triple-Chip Method.

The machine units are hydraulically actuated and electrically controlled, including safety limit switches at each



NO SHERLOCK HOLMES IS NEEDED TO FIGURE OUT

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They are heat treated, including quenching, in a neutral atmosphere, electronically controlled, and under automatic timing. This extra precaution insures high wear resistance right out to the initial working surface.

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Catalog and price list sent on request. The former includes information needed by every tool engineer Representatives and stocks in strategic industrial centers



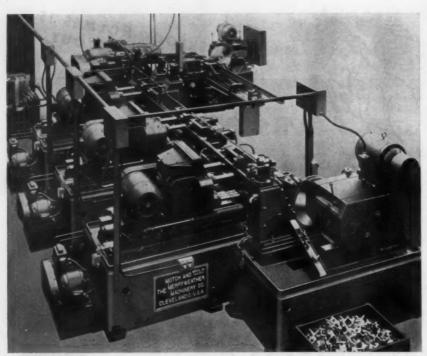
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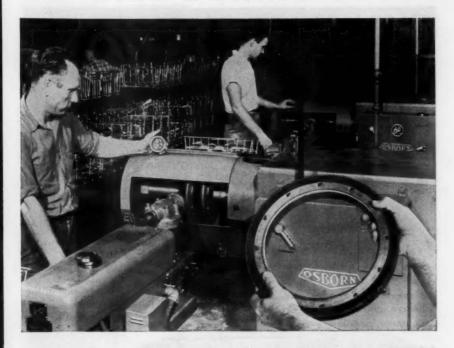
station. The transfer bar with pusher fingers is attached to the milling units. This eliminates milling cutter drag marks, because the part is moved from station to station on supporting rails during the rapid return stroke of the milling units. The bottom of the main base is open for a floor type coolant sump and chip conveyor. Special piping provides intermittent air jet and heavy

coolant wash to prolong tool life and to wash chips from the work and transfer rails. Ample spacing of the units gives easy tool access. The work is located and hydraulically clamped at each station. A tool board is provided for automatic tool cycle control, tool storage and pre-setting gauges for all tools. Designed and built by The Motch & Merryweather Machinery Company, 888 East 70th St., Cleveland 3, Ohio.

Special Impco automatic transfer machine

This special IMPCO Transfer Machine, manufactured by the Industrial Metal Products Corporation, of Lansing, Mich., is designed for complete automation. It performs all the milling, drilling, reaming, and checking operations on a V-8 engine rocker arm shaft. The complete machine cycle is 10 seconds with a gross production of 360 parts per hour.

The parts are loaded into the pallettype workholding fixtures, positioned endwise automatically, and clamped



Remove burrs <u>faster</u> with this push-button method An OBA will show you how



IMPROVED GEAR QUALITY. This before-after view of gears shour how Brushamatics remove burrs and blend surface junctures. Result is fewer stress concentrations, longer gear life.

HERE, you see push-button power brushing removing burrs and blending surface junctures on automotive gears faster than any other method.

Operating automatically on preset time cycles, two Osborn Brushamatic* machines maintain strict uniformity of quality at a rate of more than 2000 gears a day.

And, in another plant, a manufacturer reports one Brushamatic saves more than 1000 manhours every year in finishing 17 different types of gears.

Why not have an Osborn Brushing Analysis discover cost-

Why not have an Usborn Brushing Analysis discover costcutting ways to solve your burr removal problems... and cleaning and finishing problems, too? Write for your copy of BRUSHAMATIC IDEAS. The Osborn Manufacturing Co., Dept. L-13, 5401 Hamilton Ave., Cleveland 14, Obio.

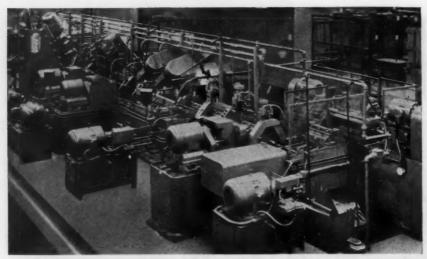


Osborn Brushes



BRUSHING METHODS . POWER, PAINT AND MAINTENANCE BRUSHES BRUSHING MACHINES . FOUNDRY MOLDING MACHINES

Encircle No. 368 on Card, Opposite Page 65



with a power wrench. The transfer system is completely hydraulic, including the return transfer unit. Drilled holes are automatically checked at the next station and de-burred at the last station after the milling operations. The parts are then automatically unclamped and unloaded on the return side of the machine. Machine has automatic lubrication, automatic chip conveyor, and pallet wash.

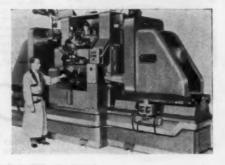
Automation embraces assembly operations, too

Here's a contribution in the field of automation, by Michigan Drill Head Co., Detroit, Michigan. It's a Dcuble End Drilling and Assembly Machine, with a trunnion type automatic index table. The machine is designed to provide you phenomenal production in a limited work area. The index table is mounted in a vertical plane to save you valuable floor space. All operations, both production and assembly, are fully automatic.

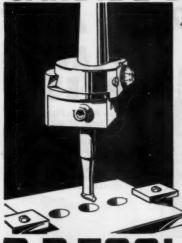
It drills 2 holes for the heat control butter-fly in the manifold; reams the 2 holes; drills the stop pin hole; hopper feeds 2 bushings; presses the 2 bushings in place; stakes the 2 bushings; reams the 2 bushings; hopper feeds the pin; and, presses the pin into place—all automatically.

This machine produces 120 manifolds per hour, with bushings and pin in place.

All units are hydraulically operated. Lubrication is automatic. Ways are hardened and ground. Vickers controls are used on the hydraulic pump and the control panel. JIC construction throughout.



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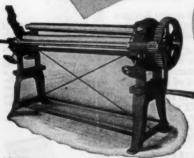
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R.B.TOOL CO., Inc.

784 No. Broadway White Plains, N. Y.

Encircle No. 370 on Card, Opposite Page 65

Selott SUP ROLL HAND FORMING MACHINE Operates to full rated capacity



ABOVE: No. 14 single back geared sliproll, floor model with capacity of 14 ga. 31 other models to meet every need.

Also manufacturers of Punches, Shears, Rod Cutters, Bending and Straightening Rolls. Operates to tull rated capacity by hand or by power! Compact and heavy duty for years and years of hard usage. The two feed rolls, geared together, assure positive feed on even the thinnest material. The third roll is idle but can be made for gear drive at nominal cost. Completed work is easily and quickly removed. Made in bench and floor models, single and double back.

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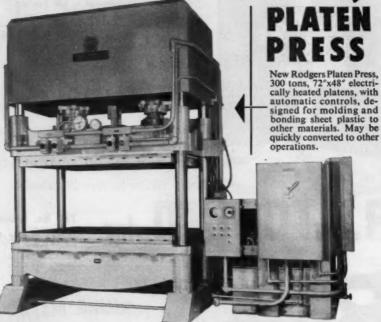
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forms or draws metals

molds and bonds plastics in ONE operating cycle

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Heated platens, which mold sheet plastic and simultaneously bond it to metal, rubber or other materials, are interchangeable with metal forming or drawing dies. By using pneumatic die cushions, the press can be converted for deep drawing of metals.

Rodgers "Double Duty" Presses are available in 10 to 500-ton capacities and with platen sizes from 12"x12" to 72"x48". Precision control equipment automatically governs platen movement, pressure, time cycles and temperature.

Operator safety is assured by equipment design.

MANUFACTURERS. If you're processing metals and plastics you'll be interested in this double duty press; let us send you more information and also a copy of our catalog describing other Rodgers "Blue Ribbon" Presses for plastic and rubber molding, metal drawing and metal forming.



Rodgers Hydraulic Inc.

7453 Walker St. & Minneapolis 16, Minn.

65
MACHINE and TOOL BLUE BOOK

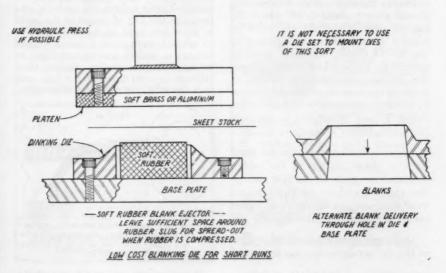
Shop HINTS



Low Cost Blanking Die Design

We have found the following method for making short runs of simple flat blanks to be very economical and to produce a quite satisfactory clean edged blank. The process will perform best on copper and aluminum sheet but we have also gotten quite good results on some of the lighter gages of soft mild steel sheet.

Another advantage of this simple die making process is that it is not necessary to mount the die and platen in a die set because accurate alignment between the die and platen is not important. It is quite important though to have the bottom of the platen parallel with the cutting edge of the die.



The die itself is made up similar to the type of "dinking die" often used for blanking non-metallic materials. It should, of course, be made up with the beveled edge of the die outward so as to contact the scrap rather than the finished blank. There will be considerable deformation of the scrap but usually this will cause no trouble.

Into contact with the dinking die is brought a "platen" made of some material softer than the die. We have found that soft brass or aluminum sheet stock will work very well but on occasion we have substituted masonite. The masonite will not be as durable and may tend to leave the finished blank slightly "cupped" around it's finished edges.

In case it is not desirable to cut a hole in the base plate and bolster so that blanks will eject out the bottom of the die, a soft rubber slug can be placed in the die opening and this will eject the blanks upward so they can be manually removed. This rubber slug should project about 1/16" above the cutting edge of the die and must be smaller in size than the opening of the die so that it will have room to expand or bulge when pressed down. The rubber slug does not have to be made to the contour of the die but can be of any convenient round or square shape. It may be secured to the base plate with rubber cement.

When operating this die the sheet stock is placed on top of the rubber slug and the press set for just enough downward travel to sever the blank. We prefer to use a hydraulic press rather than a crank press for this job.

The angle of inclination of the edges of the die are dependent upon the material being blanked. An included angle of 45 degrees has worked well for aluminum sheet or soft copper. The angle must be 60 degrees or more for steel sheet and an angle of approx. 35 degrees has given good clean results on sheet fiber.

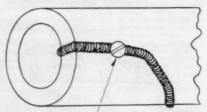
Protection for scriber points

Here is an excellent and inexpensive means for the protection of scriber (or compass) points. It is a short piece (%" to ½") of "spaghetti" (small plastic tubing used in electrical apparatus).



Threaded hole near arc weld in iron casting

Electric arc welding is a quick and economical method for repairing broken or cracked iron castings. The method has one drawback. Unless the work is annealed after welding the material adjacent to the line of fusion of the weld is often too hard to be machined. It so often happens that a break occurs through a drilled and tapped hole, as in the hub of a pulley. Rather than attempt to weld through the hole and then re-drill and tap the hole when



OPPER PLUG INSERTED
IN HOLE WHICH IS ON OR NEAR LINE OF
FISION — WELD WILL NOT ADMERE TO COPPER PLUG. PLUG CAN BE EASILY REMOVED
WHEN WELD IS COMPLETED.

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covering complete specifications and additional features is contained in this bulletin. Write for your copy. Ask for data sheet 456,

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Specify with or without keyways. Also available—hardened and ground spacing collars (with standard keyway) ½" to 3" long in all popular sizes. (For use in milling, slitting and gang-saw setups, shimming gears and bearings.)

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Detroit Stamping Co.
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Encircle No. 373 on Card, Opposite Page 65

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weld is completed, it is better practice to follow this procedure: Thread up a copper plug, screw slot one end with a hacksaw, and thread it into place prior to the welding. The weld will not adhere to the copper plug and at completion of the repair the plug can be screwed out and the hole is ready to be used.

Homemade hydraulic lifting device

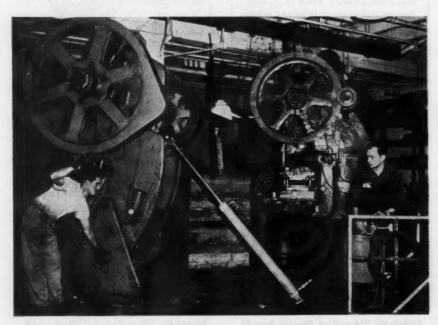
A homemade hydraulic lifting device designed by two staff engineers at Viking Air Conditioning in Cleveland lets one man tilt an open-back inclinable press in a fraction of the time formerly required by three men using an overhead hoist.

The new portable press lift is a joint creation of Harry Winter, Viking Plant Engineeer, and Frank Klak, Project Engineer.

Tilting the presses—90-ton Robinson A-5's, Cleveland 10-I's, and 21½ Blisses—to better eject parts from the dies, used to take three maintenance men

about two hours. When lowered headroom in a new Viking press-room layout eliminated the use of an overhead
hoist, Klak and Winter designed their
low-cost floor-mounted hydraulic unit.
It enables one set-up man to tilt any
of the huge presses to a new angle and
have it back in production in only ten
minutes.

The lift uses a hydraulic ram with a 40-inch stroke and 2½-inch bore, surrounding a rod with a 1¾-inch diameter. The ram is operated by its own portable hydraulic pump, which is mounted on a cart set on casters. A three-horsepower, three-phase electric motor powers the pump, which produces pressures of up





Interchangeable shanks permit E-Z Set boring tools to be used in turret lathe, ig-bore, milling machine, boring mill, automatic or other machine tools. Because they can be adjusted for cut in only one-tenth the time formerly required by similar tools, these Maxwell-made tools can meet high-speed production on schedules.

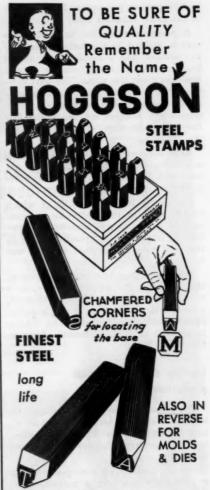
E-Z Set boring tools are available in three models having maximum boring bar capacities of ½, 1 and 1½ inches and covering a boring range of from ¾ to 20 inches.

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256-MC

THE MAXWELL COMPANY

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to 1200 pounds per square inch, enough to lift more than 2½ tons.

A permanent bracket to receive the ram is welded to the back of each of the presses, and a second floor-mount bracket sunk into the concrete floor a few feet from the press. The cart containing the motor, pump, and a tengallon reservoir can be wheeled into a convenient position by the press, and the hydraulic ram attached between the brackets.

Hose connections between the pump and ram are of coupler-type for fast attachment. Retraction is sensitively controlled by a %-inch needle valve.

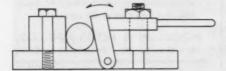
The entire lift cost \$362.19, of which \$188.90 was for the hydraulic ram assembly. The cost was absorbed in savings in labor and idle machine time in the first two weeks that the lift was in service.

Viking Air Conditioning, a division of the National Radiator Company, is a major manufacturer of furnace blowers, blower-filter packages, furnace humidifiers, window fans and attic fans. Viking is located at 5601 Walworth Avenue, Cleveland 2. Ohio.

Locking device for small production-vises

The accompanying sketch shows an original design of a locking device which can be utilized for fixtures or vises for drill-presses, shapers and milling machines.

The work-pieces are clamped between a stationary jaw and a movable jaw, the latter being actuated by an eccentric cam with a handle. The original, interesting feature of the movable jaw



is its swinging (arch-like) movement. This characteristic is of great importance because the movable jaw exerts a downward pressure upon the workpiece, which is consequently securely pressed down against the vise-base and so it is not lifted upwards as is the case with ordinary parallel-moving jaws (especially if they are a little worn).

More for less with universal quill

By Harold D. Rhodenbaugh

Boring and counter-boring, boring and facing, boring and chamfering on the same operation is always desirable when practicable. And it is practicable when tooling for long production runs where substantial investments in special tooling is justified. But what of the small quantity job-orders so peculiar to the aircraft instrument program, the job shop, the small production shop, the experimental shop? The potential in these shops is usually limited, thus necessitating extreme caution in tooling expenditures.

Figure 1 is a combination bore, counter-bore, chamfer and facing bar or quill that will greatly reduce tooling costs. A careful study of Figure 1 will reveal its more universal application than is usually found in standard catalog boring bars or borematic quills.

This quill was designed for maximum application at minimum cost. It is used in conjunction with a "Criterion" microadjustment boring head with a ½" dia. bore. The tool bits used in this bar are made up from standard solid carbide blanks %x¼x1" and %x¾x1½".

Since this bar is used in a borematic department a "centerline" of .115 is established from the banking face of the tool bit. Standard carbide blanks vary on the \%" dim. from .125 to .140. It follows that by holding a .115 dim. from the banking face of the tool bit to the cutting point or rake face of the tool bit the center-line is assured and the

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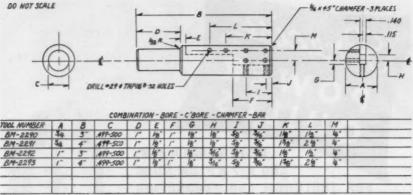


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NOTE: THIS BAR TO BE USED WITH BM-1008 CRITERION HEAD "TOOL BITS" SHOULD BE SPECIFICALLY IDENTIFIED PER TOOL NO

quill or bar can be spun in the spindle as well as being mounted on the cross-slide or carriage. By controlling the length and width of the boring tool bits which can be slid forward or backward and with your micro-adjustment up or down, the working application range is broadened considerably.

Careful consideration of the above design will soon reveal the necessity of setting up a size range in these bars to cover your range of work. They are inexpensive to make, and they are practical. With adaptors or bushings they are interchangeable from borematics, automatics, hand screw machines, etc. To insure absolute satisfaction, identify the bar or quill with the operation to be performed and T-number the boring tool bits to be used.

In this way you will realize more production, more return on your investment, for less cost and less frozen tools in your obsolete inventory.

Emergency boring tools

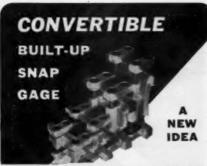
By Harold D. Rhodenbaugh

Regardless of the meticulous care with which boring bars and boring tools may be selected for planned production, there inevitably arises the occasion when the correct tool cannot promptly be had. This unhappy circumstance usually occurs after a job has been released to production and is in process of being set up on the machine. Delays in production at a time like this disrupts schedules and otherwise creates confusion.

Figure No. 1 shows an emergency

precision boring tool created in a series of sizes to meet such occasions as outlined above in an aircraft instrument plant. The size ranges were selected to fill in an existing gap between the extremely small boring tools and standard catalog boring tools in stock.

Drill rod is a standard item in most shops as are standard carbide blanks. It is very simple to cutoff and gang mill the radii in the drill rod. When the carbide tip is brazed to the drill rod a boring tool blank that can quickly be ground to size is the result. Also it is



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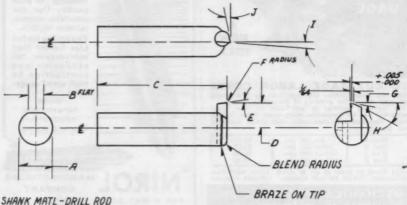
Encircle No. 382 on Card, Opposite Page 65

interesting to note that when the carbide tip has worn out or is broken, the stub can be melted out of the shank and a new one brazed in.

When the tool is to be spun as often

is the case in borematics, mills, etc., the centerline must be held in grinding.

An ample stock of these inexpensive tools on hand is good insurance against stalled or retarded production.



BREAK ALL SHARP EDGES

NOTE: WORKING SURFACES TO BE LAPPED

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BM-1502	-01	2190	18	25	.171	3°	.005	16°	55°	6°	3°	.362
BM-1503	-01	-2650 -2625	18	134	.2265	3"	.005	18°	55°	6°	30	.493
BM-1504	-01	-2650	18	2"	2265	30	.005	18°	550	6°	3°	.493
BM-1505	-01	2625	18	22		3°	.005	18°	55°	6°	3°	.493
BM-1506	-01	3/25	5/32	2"		3°	.005	12°	57°	6.	3°	.582
BM-1507	-01	3/25	432	25	28/0	3°	.005	12°	570	6°	3*	.582
BM-1508	-01	3125	5/32	3"	2810	3"	.005	12°	57	6°	3°	.582

TOOL NO	TIP SIZE
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BM-1502	SWAXRQ.
BM-1503	532 DAR. X "
BM-1504	5/32 DIA. X "
BM-1505	\$32 DIA. X "
BM-1506	3/6 " "
BM-1507	3/16 " "
BM-1508	3/4 "

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Encircle No. 385 on Card, Opposite Page 65 May, 1955

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 Stock Capacity

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This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds				
1D 2D	31/2	31/2	121/2 23				

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY 1335 SO. MAIN STREET MEADVILLE, PENNSYLVANIA

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MICRO-HEIGHT GAUGE

BY FAIRFIELD GAUGE CO.



NO OTHER GAUGE COMPARES FOR FAST, ACCURATE LAYOUT AND MEASURING

Capacities to 6" when used with this Fairfield Gauge 3" Riser

The Micro-Height Gauge is a precision instrument, finished in satin chrome, which reads like a micrometer and measures from zero at base to 3" in thousandths.

Use as a scriber for fast layout, or insert dial indicator for quick, accurate inspection.

Exclusive distributor for U.S. and Canada: CLEVELAND INSTRUMENT CO.

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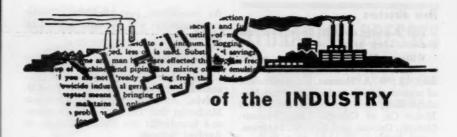
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Encircle No. 402 on Card, Opposite Page 65

MACHINE and TOOL BLUE BOOK

Los Angeles 13, Calif. Phone Michigan 7891



Tool Engineers Gather for Annual Banquet in Los Angeles

Installation of new national officers and presentation of the Society's first honor awards were featured at the annual banquet of the American Society of Tool En-



H. B. Osborn Ir.

gineers at Los Angeles March 17.

Dr. Harry B. Osborn, Jr., of Cleveland, O., was elected president to succeed Joseph P. Crosby of Hudson, Mass. Dr. Osborn is technical director of the Tocco division, Ohio Crankshaft Co. Crosby is vice president of the Lapointe Machine Tool Co.

Ernest R. Breech, chairman of the board of Ford Motor Co., received the 1955 ASTE Progress Award. The citation with the award stated in part:

"Foremost manufacturing executive . . . with proved genius for integrating materials, methods, manpower, facilities and human relations into overall organization of highest efficiency."

Philip M. McKenna, president of Kennametal, Inc., Latrobe, Pa., received the

ASTE engineering citation for "original and important contributions to the development of carbide materials and tools and their application in the machining and forming of manufacturing materials."

Other national officers

New officers of the Society in addition to Dr. Osborn are:

H. C. McMillen, plant manager, Philco Corp., Bedford, Ind., first vice-president; H. E. Collins, manager, process engineering department, Hughes Tool Co., Houston, Tex., second vice-president; R. C. W. Peterson, president and owner, Peterson Eng. Co., Toledo, O., third vice-president; Wayne Ewing, president, Arrowsmith Tool and Die Co., Inc., Los Angeles, Calif., fourth vice-president; Harold D. Long, president, Scully-Jones & Co., Chicago, treasurer, and John X. Ryneska, General Electric Co., West Lynn, Mass., secretary.

The Society created the office of fourth vice president in place of the previous office of assistant secretary-treasurer. Growth of the Society was responsible for the increase in the number of vice presidents.

New directors

The Society elected three new directors. They are:

William Moreland, assistant works manager, Greenlee Bros. and Co., Rockford, Ill.; W. A. Thomas, superintendent of manufacturing and engineering, Machine Shop and Stamping Div., Ford Motor Co. of Canada, Ltd., Windsor, Ontario, Canada, and R. C. W. Peterson.

Re-elected to the board of directors are:

A. B. Clark, technical consultant, Haynes-Stellite Co., Cleveland, O.; W. G. Ehrhardt, managing partner, Ehrhardt Tool and Machine Co., St. Louis, Mo; G. A. Goodwin, chief process engineer, The Master Electric Co., Dayton, Ohio.

J. O. Horne, owner, J. O. Horne Co., Rochester, N.Y.; C. M. Smille, owner, C. M. Smille & Co., Ferndale, Mich.; R. A. Smith, chief tool engineer, Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.

Dr. Osborn, McMillen, Collins, Ewing and Long were also elected to the board.

As immediate past-president, Crosby automatically will become a board member.

Other awards

Two other honor awards were presented in absentia. They went to Fred H. Colvin, editor-emeritus of American Machinist and O. B. Jones, president and founder of the Detroit College of Applied Science.

Colvin's award was the 1955 ASTE Gold Medal for outstanding contributions to industrial progress during his 69-year career as an author and editor.

Jones was awarded the Joseph A. Siegel Memorial Award for outstanding contributions to the Society. The award is named for the charter president of the ASTE.

Atomic energy problems discussed

Prentiss M. Brown, member of the board of directors of Detroit Edison Co., was the banquet speaker. Brown described the problems involved in the development of atomic energy for peacetime applications.

Excavation has recently begun on a \$300,000 engineering building at the Cleveland Crane & Engineering Co., Wickliffe. Ohio, shown in foreground of architect's drawing, in front of crane runway. It will be a $128^{\circ}x71^{\circ}$ brick building with a second floor section at rear measuring $25^{\circ}x138^{\circ}$. The building will accommodate 80 engineers and draftsmen. This is the third building in an expansion program started last January. At extreme right, just below water tank, is recently completed shipping and receiving building.





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Made by skilled workmen from highest quality material. Constant size and continued accuracy are assured by sub-zero treatment. Each gage rigidly inspected.

Emergency situations in your plant solved by our unusually prompt delivery.



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Save your large JIG BORERS for large jobs . . . put small precision work on the LINLEY

The Linley Jig Borer provides the means . . at very low cost . . . of handling your most exacting requirements in precision. With it you can out costs through having a tool exactly fitted to your small work . save your larger machines for larger work.



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Table Movement: 6"x10" Table Size: 7"x17%" Send for sumplete information TODAY!

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HYDRAULIC PRESSES



Capacity Send for Catalog Showing Complete Line

GREENERD ARBOR PRESS 141 CROWN ST. NASHUA, N.H

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'FLEXIBLE JAWS' grip all shapes. Grips secure and positive for precise milling, drilling and cutting operations. Eliminate the time and expense of blocking and shimming irregular pieces for toolroom machining. Applicable on any machine tool. Try it in your shop. Save time and dollars on small production runs.

WRITE FOR INFORMATION TODAY!



AMERICAN POSITIVE GRIP VISE CORP.

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MUMMERT-DIXON FACING HEADS

with Automatic Feed

One-way Tool Feed-6, 9 and 10" sizes.

Two-way Tool Feed-9, 12, 16, 20, 24, 30, 36, 40 and 46" sizes. Save many costly set-ups.

Bulletin No. 4141 Gives Full Details MUMMERT-DIXON CO., 122 Philadelphia St., Hanover, Pa.

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Encircle No. 408 on Card, Opposite Page 65



CASE HARDENING

WITHOUT SPECIAL EQUIPMENT NON-POISONOUS . NON-EXPLOSIVE . NON-INFLAMMABLE

5 lb.-\$9.25 10 lb.-\$17.40 F.O.B. New York

Dealers' Inquiries Solicited. WRITE FOR DETAILS TO:

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BOX H NEW YORK 14, N.Y.

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RLH

CONSTANT TORQUE COUPLINGS with AUTOMATIC COMPENSATION

for Friction Variation

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Type

Torque settings unaffected by normal variations in co-efficient of friction. Breakaway torque and running torque become truly constant.

SPECIAL SHANKS FURNISHED TO ACCOMMODATE INDIVIDUAL APPLICATIONS

BUFFALO MACHINERY CO., Inc. 835 GRANT STREET BUFFALO 13, N. Y.

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MACHINE and TOOL BLUE BOOK

American Society for Quality Control convention in New York, May 23-25

Representatives of more than 75 corporations and 21 educational institutions will be speakers or panel moderators at the ninth annual convention of the American Society for Quality Control, May 23-25 at the Hotels Statler and New Yorker in New York City.

Additional speakers will represent the Dept. of Defense, Army, Navy, American Iron & Steel Institute, American Standards Assoc., American Management Assoc., Corn Industries Research Foundation, Methods Engineering Council, National Canners Assoc., and the International Ladies Garment Workers Union. More than 3000 delegates are expected to attend.

Special programs have been organized in the fields of metals, standards, electronics, aviation, chemistry, paper, food, textiles, brewing, automobiles, research,

BALDOR GRINDERS

BALL BEARING - TOTALLY ENCLOSED - HEAVY DUTY

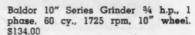


Baldor Grinders are available in bench and pedestal types with 6" to 12" wheels. Baldor Grinders are better be-

More Rugged — Arbor diameter % and "sealed-for-life" ball bearing Size .05.

More Versatile — Wide clearance between wheels and motor frame permits grinding of large or odd shaped pieces.

Baldor is a basic manufacturer of grinders—even the motors are built by Baldor.





Special Carbide Tool Grinder built especially for sharpening carbide tools quickly and accurately. Reversible V_2 h.p., motor withstands repeated overloads. \$149.00.

BALDOR ELECTRIC COMPANY 4368 DUNCAN AVE. ST. LOUIS 10, MO.

Encircle No. 411 on Card, Opposite Page 65

business administration, applied methodology, and quality control education and training. Discussion topics will ange from the production of guided missiles to bottle washing.

Principal speakers at special luncheon programs will include Dr. Ralph C. Hutchison, president of Lafayette College; Dr. Mason W. Gross, provost of Rutgers University; Dr. L. Grant Hector, vice-president in charge of technical operations at Sonotone Corp., and W. L. Gore, of E. I. duPont DeNemours & Co.

Dr. Hector will speak on "The Management Yardstick for Measuring Quality Control Performance" at the general luncheon on Tuesday, May 24. Dr. Gross will be the general luncheon speaker on Wednesday, May 25. Mr. Gore will discuss "Contributions of Statistical Methods to Chemical Enterprises" at the Chemical Div. luncheon

LASSY

1. Save Hundreds of Tooling \$\$\$\$\$\$

- 2. Convert Tooling Time to Production Time
- 3. Increase Production and Quality

PLUS! Low Initial Cost Nothing Else Like It.

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Medel P2 Cap. 1/2" to 2" Other Medels and sizes to 4" Cap.

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Order direct or write for name of Stocking Dealer in your area. Illustrated circular FREE

LASSY TOOL CO. Plainville, Conn.

on Monday, May 23. Dr. Hutchison will talk on "Human Freedom and Foreign Policy" at the Metals Terhnical Committee luncheon on Wednesday. The Textile Div. will conduct a special luncheon program on Tuesday.

A. M. Thomas is director of sales

A. M. Thomas has been appointed director of sales for the Heller Bros.

Co. of Newcomerstown, Ohio, according to George Hodapp, president.

Thomas started with the company in the St. Louis territory and was made Chicago district manager in January, 1951.

New York sales office moves

The eastern district office of the Yoder Co., Cleveland, O., is now located



Industry required a 48-inch diameter Rotary Permanent Magnetic Chuck. O. S. Walker Company, Inc., Worcester, Mass. responded by designing and building this permanent chuck, the world's largest—and larger sizes are now available. Where accuracy and positive parallelism are required WALKER design guarantees quality controlled dimensional standards. Whatever your holding problems—magnetic or vacuum— Walker engineers have the answer. They are as close to you as your telephone—Worcester, Mass. PLeasant 6-6293.

in the new Ridgeway Professional Building, Stamford, Conn.

R. H. Brinker, manager, and T. R. Bullen, representative, have been located for the past several years at New York City.

Cleveland Tapping Machine sold to H. P. Townsend Co.

Automatic Steel Products, Inc., has announced the sale of its wholly cwned subsidiary, The Cleveland Tapping Machine Co., Canton, Ohio, to the H. P. Townsend Mfg. Co., of Hartford, Conn. No change in name is contemplated and the business of Cleveland Tapping will remain at its present location with the same personnel.

Lehmann Boring Tool Purchased

Purchase of the Lehmann Boring Tool Div. of Novo Engine Co. by Fulton Iron Works Co., St. Louis, was recently



IT'S A SERIOUS COST-PROBLEM:

Metalworking plants are pouring coolant and labor dollars down the drain. The reason: coolant turns rancid.

RANCE-RID SOLVES THE PROBLEM:

It restores the original condition of the oil emulsion. It smells, looks, and is like new. No masking odors are used... Use it in central-type coolant systems, or in individual machines. Treat the same coolant over and over again!

TRY RANCE-RID-AT OUR EXPENSE:

That sounds generous. Actually, it isn't. Rance-Rid sales have been built on one-ounce samples. Just one ounce treats 20 gallons of soluble oil emulsion... Try it—at no cost, Your inquiry brings the sample.

HERSEN CHEMICAL CO.

824-C FISHER BLDG., DETROIT 2, MICH.



announced by Walter A. Gantner, Fulton president.

Key management personnel will continue with the firm. T. J. Sleeter carries on as chief engineer and Russell L. Cole as sales manager. All production supervisors and employees will also be retained.

Stock reel prices cut

New low prices for their automatic stock reel have been announced by Jaco Devices, Inc., 99 High St., Hingham, Mass. Price reductions have been made possible by a volume merchandising program, with consequent increased production.

Firth Sterling acquires Houston Carbide Corp.

The board of directors of Firth Sterling Inc., Pittsburgh, Pa., have authorized the issuance of sufficient capital shares of Firth Sterling stock to acquire

FIRST for secondary finishing...



SCHAUER SPEED LATHES

Filing cast iron flange with variable speed type VA3CCA Schauer Speed Lathe.

Schauer Speed Lathes provide the most economical method for performing secondary finishing work on metal and plastic parts. Do filing, trimming, deburring, lapping, polishing, etc., faster, at lower costs on Schauer Speed Lathes. Many sizes and models with holding devices to suit the job. Speed your production with Schauer Speed Lathes. Write for Catalog No. 530.

SCHAUER MANUFACTURING CORP.

4502 Alpine Ave.

Cincinnati 36, Ohio

the assets of the Houston Carbide Corp. of Houston, Texas, which will be operated as a division of Firth Sterling, with its existing organization remaining unchanged. The plant is equipped for pressing, sintering and shaping carbide products.



The grinding wheel plant of the Cincinnati Milling Products Div., Cincinnati Milling Machine Co., is one of the world's most modern wheel manufacturing plants. With the addition of new equipment and development of new manufacturing standards, the company claims it is possible to duplicate an original grinding wheel each time it is reordered.

KUTMORE ADJUSTABLE

A MIGHTY MIDGET!

This Midget Floating Holder Hollow Mill, flange type, has micromatic adjustment, and is designed to permit easy compensation for any spindle misalignment. Small, sturdy, extremely accurate!

WRITE TODAY FOR CATALOGUE No. 20-BB

It shows complete line of adjustable hollow mills. Our Engineering Dept. is at your disposal for special requirements.



CARL WIRTH & SON, INC. 1625 CLINTON AVE. NO. ROCHESTER 5. N. Y

Purchase of 32 acres along the Huron River, between Ypsilanti and Ann Arbor, Michigan, has been announced by the American Society of Tool Engineers. Shown at right inspecting the site are (left to right): Harry E. Conrad. ASTE executive secretary; Ray H. Morris of West Hartford, Conn., ASTE past president; and Albert M. Sargent of Detroit, ASTE charter member and past presi-



A SMALL LOT METAL STAMPING SERVICE AT LOWEST POSSIBLE DIE COST



Regardless of the small quantity needed, DR Stamping Service gives you quality, accuracy and economy. In addition to blanking and piercing operations, our process includes forming operations. Uniformity is assured no matter how many times you reorder. Changes such as relocating holes or changing size done at very moderate cost.



You will find that the DR Method of producing metal stampings, where quantity lots are limited, gives you worthwhile cost savings because of the high cost of conventional tooling on such requirements.





\$22.60 for first 100 pieces including tools. \$4.10 for each additional 100 pieces. Plus actual market price of material for stamping.



Send us a blueprint of your stamping needs and we will send quotation.



DAYTON ROGERS Manufacturing Company

MINNEAPOLIS 7C, MINNESOTA Encircle No. 417 on Card, Opposite Page 65

Hartford Special buys Rockwell drill unit line

Purchase of the complete line of Rockwell Hydraulic drill units from Rockwell Mfg. Co., Pittsburgh, by The Hartford Special Machinery Co., Hartford, Conn., has been announced in a joint statement by both companies.

Hartford Special has assumed the manufacture, sales and servicing of

these units, which will be produced by the machine tool division in its new Simsbury, Conn., plant. Transfer of special equipment, tools and inventory to Simsbury from Rockwell's Pittsburgh plant has been effected. In addition, key sales, engineering and production personnel of Rockwell's drill unit division have been retained by Hartford Special and will relocate in the Hartford area.



Encircle No. 418 on Card, Opposite Page 65

Appointments and Promotions

Barber-Colman Co., Rockford, Ill., has announced the appointment of **Howard A. Nelson as** sales manager of the small tool division and **Charles A. Torson** as sales manager of the new Hendey machine division.

S. Malcolm Blanch, former clerk-treasurer, has been elected chairman of the board of the Anderson Corp., Worcester, Mass. Brent R. Anderson, former vice-president, was elected president and William C. Arthur, formerly associated with the Norton Co. as assistant to the treasurer, was elected vice-president and assistant works manager.

Gilbert R. Jarman has recently been appointed general sales manager of all products of the Marshall Steel Co., LaGrange, Ill.



S. Malcolm Blanch



Brent R. Anderson

The Capewell Mfg. Co., Hartford, Conn., has announced the appointment of William C. Heard as domestic sales manager. Heard comes to Capewell after eight years at the Millers Falls Co. of Greenfield, Mass.

Firth-Loach Metals Inc., McKeesport, Pa., has announce the appointment of Robert C. Lindberg as superintendent of production, and William C. Seitz as manager, research and development.

INDEXING TURNTABLES



AMS



Elsier makes over 100 different types of indexing mechanisms for spraying, glass insulators, melting and glass spazing with retating stations and meterized er hand operated. Retating tables of all kinds for over 35 years. We supply any part or complete equipment and we make special turn-tables and cams to your specifications. You are: invited to see our showreem and each for yournelf our many medels on display.

CHARLES EISLER JR., PRESIDENT EISLER ENGINEERING CO., INC., 762 So. 13th Street, Newark, N. J.



John B. Perkins

John B. Perkins vice-president of tool sales, will transfer to the West Coast Dec. 31, 1955, to take charge of the company's Los Angeles office until his retirement. Also appointed was Gerald W. Caruso as assistant sales manager.

Frank J. O'Laughlin has recently been elected president of the Commander Mfg. Co., Chicago. J. B. Chamberlain, former head of Commander, will be



Gerald W. Caruso



UNIVERSAL ANGLE PLATE BOSTON

Precision Tool that Holds Work of Any Desired

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Puts Speed and Profit into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Made in several stock sizes. Write today for full information.

AUTOMATIC BOX MACHINERY CO., Inc.

11 ARBORETUM RD. BOSTON 31, MASS.

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for chamfering bar stock PRIOR TO SCREW MACHINE OPERATIONS The KENT BAR POINTER

Entirely self-contained. Manual or pneumatic operated feed and gripping mechanism. Capacity %" minimum diameter up to 21/4" hexagon, Stationary and portable.

Literature available.

The KENT MACHINE CO., Cuyahoga Falls, Ohio Drillers . Threaders . Slotters . Countersinkers . Bar Pointers

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Encircle No. 423 on Card, Opposite Page 65

ORICAL SUB-PRE

Dies for high precision work should not only be perfectly aligned but provision should be made to maintain that alignment throughout the life of the die. Our bulletin shows how it can be done.

WALTHAM MACHINE WORKS WALTHAM 54, MASS.

ARCH SUB-PRESS

SUPERIOR QUALITY AND WORKMANSHIP PLUNKET VISES



SQUARE BASE SHAPER VISE

The Shaper Vise has graduated swivel base and tongue in center to fit slot in table, and has holes for bolting down. In ordering this vise give size of slots in Shaper Table, also distance from center

J. E. Plunket Machine Co. 3230-32 Are Chicago 8, 111.

Encircle No. 424 on Card, Opposite Page 65



F. J. O'Laughlin

less active in the management of the company, but continues his interest as chairman of the board.

The Ex-Cell-O Corp., Detroit, has announced the election of Omer E. Robbins as a director to fill the vacancy on the board created by the recent death of Leslie M. Johnston of Pittsburgh. Mr. Johnston had served as a member of the board since 1931.



Omer E. Robbins





A. D. Moncrieff

George N. Popham was recently elected president and general manager of the Gorham Tool Co., Detroit, Mich. Popham has served as vice-president and sales manager of the firm for the past 13 years.

Appointment of A. D. Moncrieff as manager of the machine tool and cutting tool divisions and Clayton E. Scott as chief engineer for Michigan Tool Co.,



Clayton E. Scott

FOR DRIVING RECESSED HEAD SCREWS

MAGNA HOLDERS Do it quicker, cheaper

Hundreds of leading manufacturers specify Magna-Tip (magnetic) screw holding accessories for their power screw-drivers to push production up, costs down. Here's how Magna-Tip Bit Holders can work for you:

- 1. Eliminate prepositioning screw
- 2. Allow faster driving in tight spots
- 3. Prevent screws from dropping
- 4. Eliminate screw head burring
- 5. Increase bit life by reduced slippage
- 6. Safer... operator doesn't hold screw

Ask your power screw-driver salesman to show you these handy Magna accessories.

New Manual ready; write Dept. 45-F. Complete information on Magna Bit Holders, Finders, Sockets and Hand Screw-drivers. Magna Driver Corp., 779 Washing-

ton Street, Buffalo 3, N. Y.



Charles R. Staub

Detroit, Mich., has been announced. Charles R. Staub, chief engineer since 1936, has been named staff consultant.

The Behr-Manning Corp., Troy, N.Y., has announced that Edwin C. Evans has been made vice-president and assistant general manager, and William I. Clark, Jr. has become assistant to the president in addition to his present responsibilities as secretary of the company.



Edwin C. Evans

THIS KEYWAY BROACH KIT



Pays For Itself In No Time!

With du Mont
Minute Man Kits
like this you can
cut any size keyway from
1/16" to 1" in any bore from

1/4" to 3" in one minute for as little as one cent per keyway.

BROACH SQUARE HOLES, TOO!

Minute Man High Speed Square Broaches for ½6" to ½" squares finish cast or drilled holes much more accurately and far cheaper than by hand. Ideal for boring bars, milling cutters and a raft of applications.



The du MONT CORPORATION, Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST T describing 25 standard kits, 23 standard broach sizes, 71 bushing sizes, square broaches and a wide range of SPECIAL BROACHES to

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ving Production CHUCK

Will pay for itself in 60 to 90 days

On turrets, engine lathes, cutting-off machines, drill presses or any type of chucking machine, the Barker Two-Jaw or Three-Jaw hand operated chuck will increase production up to one third and actually pay for itself while doing it in from 60 to 90 days. Hand lever eliminates pneumatic and hydraulic systems, yet closes and locks jaws with lathe running or stopped. Over 30 years

of labor saving, production boosting operation.

Write for bulletin 201 today.



Top Jaws open



Drills 2

to 8 holes at one

stroke

model

Jaws locked

Encircle No. 428 on Card, Opposite Page 65



24 S. HOYNE

adjustable

Increase production up to 800%...save time, cut costs. MULTI-DRILLS make any drill press cut costs. MULTI-DRILLS make any drill press produce more. Attached without alterations or special tools. Quick, easy setups of universally adjustable spindles give you more flexibility ... wider application. Handles any hole pattern within 9" circle; centers close as ½" Extension Spindles available to increase working area to 22½". Special adaptations available.

DRILLS ANY









See your Commander Distributor for complete details. Write for the NEW Commander Full Line Catalog.

Chicago 24, Illinois 4221 W. Kinzie St.

Product of Commander ... Builder of Production Tools Encircle No. 429 on Card, Opposite Page 65

Shown for the first time—now on display in the following cities



Builder of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes

Encircle No. 430 on Card, Opposite Page 65

Chicago 41, Illinois



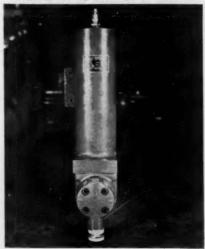
Device Gives Positive-Hold-Down In Drawing or Forming

The compact Die-Draulic Grip is claimed to provide the required die pad pressure from the beginning of the stroke.

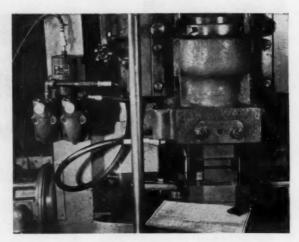
Small pistons, usually 1½" dia., operate in sleeve inserted in the die. A small tank filled with hydraulic oil, one or more control valves and the pistons comprise the system.

Oil is forced into the cylinder cavities in the dies by air pressure from the shop air line. No oil or air is emitted during the operation; in fact, after an initial air charge the air line could be disconnected. The oil is locked into the system by a special check valve. Pressure created by a slight movement of the press ram delivers the pressure necessary for holding. As the stroke progresses this pressure builds up only slightly to the extent of the compressisingle valve unit. Air inlet at top. Adjusting screw at bottom.

bility of the oil. When this limit is reached a control valve designed for this purpose trips and permits the oil



Illustrating a two-valve unit mounted on press. Part being formed is shown on bolster plate.



to return to the tank for the next cycle.

Holding pressure is adjustable. When a two-valve unit is mounted on the press valves control the various holding pressures required in, for instance, the upper and lower sections of a die or in the several stations of a progressive die. Each control valve is adjusted by simply turning a thumb screw. Only one tank is required in each system. The unit of tank and valve or valves is usually mounted on the side of a press. The hydraulic oil may be trans-

mitted to the die through high pressure hydraulic hose.

As many pistons as are required are incorporated in the die. The unit has a capacity of 5000 psi. Each 11/8" dia. piston, which has an area of roughly one square inch, will deliver a pressure of close to 5000 lb. Pistons of other diameters will deliver in proportion. Grand Valley Machine & Tool Co., Dept. BB, 528 Butterworth St., S.W. Grand Rapids, Mich.

Use ACTION Card, opposite page 64. Encircle No. I

Portable drill press eliminates dis-assembly work

An all-angle portable drill press which will drill and tap from practically any location with its machine spindle in almost any position, and which combines advantages of the conventional fixed radial drill with those of the portable, has been announced by Sun Tool & Machine Co., Dept. B, 4792 Bennett Rd., Toledo, O.

The unit permits bringing the machine to the job and eliminates disassembly of large and heavy work pieces, as well as some hand drilling and tapping operations.

The machine will drill as close as 14½" to, and as far as 38" away from, its column; the head rotates on a graduated swivel a full 360° from vertical and the drill head rotates 360° on the column. It has four speeds, 185-280-400 and 600 rpm, with a four second average speed change.

Drill capacity is 1¼" and tapping capacity, %" uss in cast iron; spindle drilling depth, 5".

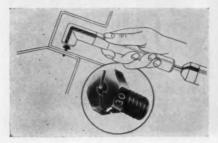
Maximum distance from the spindle to the base is 59", but it may be ordered in column height to suit requirements. Over-all height of the drill press is 86" and the over-all dimensions of the base



are 6" x 28" x 43". It requires a floor space of 28" x 60" and will go through an opening 30" wide and 90" high.
Uso ACTION Card, opposite page 64. Encircle No. 2

Collet for broken drills

A special collet for use with broken drills, Type 200-3, features a ¼"-28 threaded shank which screws directly into the spindle of small angle heads, similar to the type used for sheet metal work. The collet requires no adapter and since the drill bit can be broken to a minimum length, the usual overhang of the drill and the chuck at the end of the angle head is said to be reduced. This feature provides access for angle drilling in tight spots, the manufacturer claims. Collet is adaptable to drills in the size range from



No. 50 to No. 26 inclusive. Ritmar Corp., Dept. B, 183 New York Ave., Huntington, N.Y.

Use ACTION Card, opposite page 64. Encircle No. 3

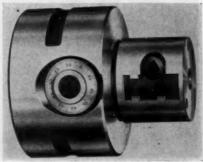
Offset boring heads in two styles

Casler offset boring heads are available in two styles: A and C. Style A can be adapted to cover a wide range of work, from the smallest to the largest size holes. It is designed to be threaded to the nose of the machine tool spindle, although it can be mounted on a taper shank to fit the spindle if desired.

Head consists of a cylindrical cast iron body, threaded to fit the machine spindle or taper shank. A circular off-set plate is held against the face of the body by means of a jib ring. Offset plate is threaded to receive the drill chuck or boring bar and rotates with the head, but is adjustable across its face by means of an adjusting screw which is graduated to .001".

Style C head is designed for small work where all features of Style A are not required. A hardened V block and two set screws insure a rigid grip of the tool. The micrometer screw which controls the offset is graduated to read to .001".

Style A head is available in sizes 30, 40, 60, and 80, while Style C can be had in size No. 3-C only. Westcott Chuck Co., Inc., Dept. BB, Oneida, N.Y.
Use ACTION Card, opposite page 64, Encircle No. 4





Light duty radial drill has three spindle speeds

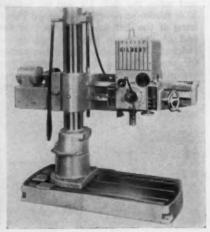
A 3 hp light duty radial drilling machine announced by the Cincinnati Gilbert Machine Tool Co., Dept. BB, Cincinnati 23, Ohio, offers three spindle speed ranges: 40-1600, 50-2000, and 80-3200. Twelve geared spindle speed changes are provided in the head by means of sliding heat treated and hardened alloy steel gears mounted on ground integral multiple splined shafts.

The machine is equipped with an automatic reverse to spindle. Spindle and spindle sleeve are counterbalanced by an adjustable spring mechanism. The spindle nose has a Morse taper hole fitted with a renewable hardened tang slot.

The head is mounted on the arm on two-dove-tail slides which require no adjustable gibs because the weight of the head is carried on adjustable ball bearing rollers which operate on a hardened and ground way.

Standard feed mechanism has four feeds: .003" - .007" - .011" - .015" per revolution. The machine is built with 3' or 4' arms and 9" column.

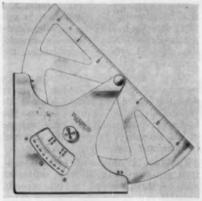
Use ACTION Card, opposite page 64, Encircle No. 5



Encircle No. 431 on Card, Opposite Page 65

Stainless steel draftsmen's protractor has work saving features

Stainless steel construction, convenient size, positive setting, accuracy to 5 minute or one-twelfth of a degree—these features are claimed for the No. 361 draftmen's protractor with vernier scale developed by The L. S. Starrett Co., Dept. BB, Athol, Mass. It lies flat on the drawing board and locks at any desired setting by means of a single knurled binding nut which also serves



as a knob for picking up the instrument.

The protractor arc is graduated 90° and figured both ways to read from right or left. A 6" scale on the straight edge of the arc, graduated in 16ths, is an additional convenience.

Protractor does not have to be reset to obtain the complement of any angle. A line marked off against the edge of the stock will automatically form the complement of the angle to which it is set.

Use ACTION Card, opposite page 64. Encircle No. 6

Self-contained hydraulic power unit

A self-contained hydraulic power unit for drilling, reaming, counterboring, spot facing and chamfering, Drillmation Model 500, offers a number of interesting features.

The variable delivery hydraulic pump

TROYKE ROTARY TABLES

- · Saves fixtures and time consuming
- · Saves time in circular positioning.



CAM LOCKING TYPE ROTARY TABLES Three sizes: 12", 15", 18".

This model is intended for die sinking, bench work, and assembly of machine units when quick rotation and positioning are required.



STANDARD MODELS WORM WHEEL OPERATED ROTARY TABLES

Five sizes: 9", 12", 15", 21".

For die sinking, jig boring, cam milling. Indispensable in wood and metal pattern shops.



HEAVY DUTY MODELS WORM WHEEL OPERATED ROTARY TABLES

Three sizes: 18", 21", 25".

These larger, heavy duty models are used for jig work, planer jobs, and on horisontal boring mills.

DIVIDING ATTACHMENTS or DRILL-ING ATTACHMENTS can be furnished

> SEE YOUR DEALER OR WRITE TO US FOR COMPLETE CATALOGS

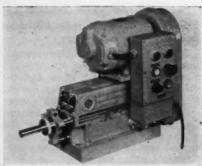


TROYKE MFG. CO.

CINCINNATI 9, OHIO

Encircle No. 432 on Card, Opposite Page 65





is an integral part of the spindle and quill. Hydraulic feeding thrust is applied directly behind the spindle, eliminating deflection and assuring smoothness of feed on heavy operations, the manufacturer claims.

Rapid approach and return are accomplished by a built-in air cylinder which is controlled by a solenoid air valve. Unit is cool-running, because the hydraulic pump delivers only volume of oil necessary, at pressure required to overcome machining resistance.

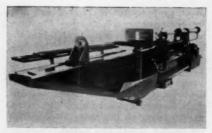
The tool is automatic and all controls are accessible. There is unlimited reserve thrust at all spindle speeds, variable rate of traverse, positive depth control, thrust control, and infinitely variable feed rate. Spindle drives may be V-belt, pulley, direct motor, gear reduction, or transmission. Drillmation Co., Dept. BB, 21509 John R., Hazel Park, Mich.

Use ACTION Card, opposite page 64, Encircle No. 7

Broaching machine for boring bars

Sturdy Broaching Service, 23516 Telegraph Rd., Detroit 19, Mich., has announced a new custom built horizontal precision broaching machine which will broach boring bars up to 8" dia., of any length, and up to 1\(^{1}\)4" square.

The unit is also adaptable to other precision broaching applications, especially those where internal broach surfaces have to be located in parts with



irregular outside contours.

The machine base is of I beam construction. Follower and pull head of the ram feature fixed-in-line centers, and are guided on hardened and ground steel ways. The work table is raised or lowered in line with fixed center of machine, or can be rotated to any position up to and including 45°. All controls and setup adjustments are within reach of the operator standing at the work table.

Use ACTION Card, opposite page 64, Encircle No. 8



Expandable mandrel driver for vertical honing

A new driver with three expandable mandrels designed for vertical use in drill presses for honing within a range of three to six inches has been developed by Superior Hone Corp., 1600 Elreno St., Elkhart, Ind.

Each of the mandrels, which bayonet into the driver, are available separately. They allow for a cne-inch expansion, picking up ranges in 16ths of an inch by changing a combination of shims and inserts which are doweled into the body and held by set screws. The same shims and inserts are used on all three mandrels.

Sets of stones ground to the correct diameter are available for each mandrel. Each set, by bending the wires slightly, pick up the range after setting the proper insert and shims.

The 3A-48-64 mandrel permits a 3"-

PRICE LIST

ON HANNIFIN STOCK HYDRAULIC PRESSES

1-TON														\$	5	52	
2-TON														\$	6:	27	
5-TON														\$1	,21	36	
8-TON														\$1	,58	31	
O-TON														\$1	.8	55	
5-TON														-2			

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

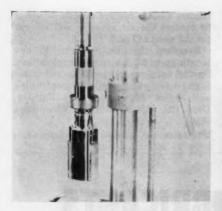
Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.



HANNIFIN

HANNIFIN CORPORATION, 529 S. WOLF ROAD, DES PLAINES, ILLINOIS



4" expansion; the 3A-64-80, 4"-5", and the 3A-80-96, 5"-6". They can be used only with the associated MD-4 Superior mandrel driver which comes with a 2, 3. or 4 Morse taper.

Use ACTION Card, opposite page 64. Encircle No. 9

Air pressure gun has one moving part

The heavy-duty Milair air pressure gun has a specially designed nozzle which provides a high volume air sup-





Rehnberg-Jacobson ALL-MECHANICAL Drill, Tap, and Index Units are specially designed for YOU to use for making up YOUR OWN special-purpose machines - or for adding to or modifying some of the special-purpose (or standard) machines you now have. They are accurate, efficient, economical - and available in enough models and sizes to suit most every need. WRITE TODAY for Data Sheets giving complete engineering information.

TAP UNITS, for example. are made in four capacities from 5/16 - 18 and 1-1/4" stroke to 1-1/2 · 6 and 4-1/2" stroke. They are self-contained, with lead screw feed.



REHNBERG-JACOBSON MFG. COMPANY KISHWAUKEE ST., ROCKFORD, ILLINOIS ply, yet at a low velocity, so that a standard gun can be used for cleaning jobs from blowing hard to dusting off.

The air gun will not "blast" when cleaning around machines, it is claimed. Construction is simple and compact. There is only one moving part and metal-to-metal valve and seat; no rubber or leather seats, springs or ball checks. It cleans itself automatically with each discharge of air. A safety

control handle further enables the user to control the air velocity and volume for the need at hand.

Standard tips are available in any length up to 48" for special applications. Special nozzles provided to specification. Standard curved nozzle is nonturning with collet. Milwaukee Air Gun Co., Dept. BB. 2624 N. 56th St., Milwaukee. Wis.

Use ACTION Card, opposite page 64, Encircle No. 10



LUBRICANTS A BIG AID IN **WORKING ALUMINUM**

These Fiske Lubricants are especially recommended for the successful working of Aluminum and Aluminum Alloys.

Machining	.C.S.A. No. 2 Cutting Oil
Rolling	Majestic Soluble Oil
Die Casting23	1 Die Casting Compound
Stamping	Magic Compound
	Magic Compound
Wire Drawing	Magic Compound

Cleaner Product and less tool wear are the reasons why Fiske Lubricants are used in progressive metal working plants that produce the highest types of aluminum products.

Information on each of the many Fiske Lubricating Specialties is available in bulletin form. Send for bulletins describing lubricants of interest to you.



FISKE BROTHERS REFINING CO.

Newark 5, N. J. and Toledo 5, Ohio

METAL WORKING LUBRICANTS

> Encircle No. 437 on Card, Opposite Page 65 MACHINE and TOOL BLUE BOOK

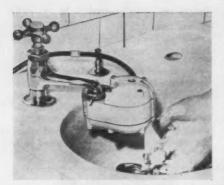
Portable water heater attached to faucet

A simple way has been found to produce hot water from any standard cold water faucet measuring up to 15/16". With the Thermojet attachment, the cold water is turned hot within two seconds.

A long water path, made up of a series of winding, constricted channels, produces an electrical resistance of over 500,000 ohms, permitting a current flow of less than 1/5 of a milliampere, thus providing complete safety, it is claimed. Alternating current only.

The faucet handle regulates the temperature of the water. Turned on just a little, the water is steaming; turned on more, the water is hot; when the faucet handle is turned all the way, the water is warm. No current is used when the faucet is completely turned off,





even though the unit remains plugged in; hot water is used only as needed.

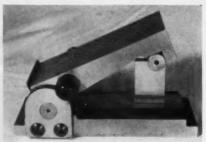
No tools are required to attach the unit. It can be removed and transferred to another faucet. Weight is 3 lb., dimensions, 3" x 4½". Greatex Products, Inc., Dept. BB, 890 6th Ave., New York 1, N.Y.

Use ACTION Card, opposite page 64. Encircle No. 11

Hinged sine plate provides locked setups

A hinged sine plate with a positive locking device to hold setups in place is claimed to provide a rigid unit for grinding and similar operations, and does not place any strain on the rolls. The precision ground bodies are constructed of alloy iron which is double normalized for stability.

Base is made of hardened mehanite. Sturdy end plates prevent slippage.





Tapped holes on the working surfaces provide a method of clamping work. The hardened and ground rolls are within .0001" of the same diameter and their seats are hand scraped to assure accuracy. Unit may be used with a permanent magnetic chuck if preferred. Bald Eagle Tool Co., Dept. MTB, 357 Minnesota St., St. Paul 1, Minn.

Use ACTION Card, eppesite page 64, Encircle No. 12

Heavy duty metal cutting band saw

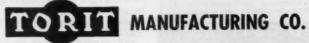
A heavy duty, hydraulically operated metal cutting band saw, Model 1200, has an electrical system providing overload and low voltage protection and 110 volts at controls for greater safety; push buttons and other controls located at convenient height for operating ease.

Other features claimed are: Blade pressure controls with a wide range of



See our catalog in Sweet's Machine Tool File, or write:

heat balance. Find out now how Torit unitized dust control is engineered to your problems.



303 Walnut Street

St. Paul 2, Minn.

Encircle No. 440 on Card, Opposite Page 65



CENTER DRILLS



Made of finest high speed steel. Available in all standard sizes. Always in stock for immediate delivery. Specials made to your specifications.





High speed. Right hand 1/4" shank. Diameter from 1/4" to 1/4". Standard sizes in stock for immediate delivery. Complete set —41 sizes—available in sturdy, hardwood box. Saves time and money, because you always have the size you need.



CENTER REAMERS

High speed steel, Reamers from 1/4" to 1" regularly furnished with 60", 82°, 90° included angle. Specials made for your specifications.

LATHE MANDRELS



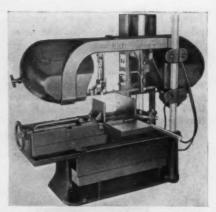
Precision made of tool steel, hardened and accurately ground. Tapered .0005" to the inch. Mandrels from 8/16" to 1" are .0005" undersize at small end, from 14" to 3", .001" undersize. Immediate delivery.

Write for Literature

Illustrated literature and prices on all KEO Products mailed on request.

KEO CUTTERS

19326 Woodward - Detroit 3 Mich



uniform feeding pressures; automatic cutting cycle; special chip flushing unit; heavy-duty adjustable blade guides; foolproof blade tensioning; adjustable stops for die block depth cutting, and rigid positive stock stop.

The saw has a capacity of 12¾" for rounds; 12" x 16" and 11" x 18" for rectangular shapes. Driven by a 1 hp motor, the blade (13'6" x 1" x .035") can be operated at selective speeds for 60, 115, 200 or 300 fpm. Base area, 28" x 48"; over-all size 44" x 78" x 60"; floor to top of bed, 24¼"; shipping weight, approximately 1950 lbs. Wells Mfg. Corp., 707 Coolidge Ave., Three Rivers. Mich.

Use ACTION Card, opposite page 64, Encircle No. 13

Metric taps now made in U.S.A.

Standardized metric taps are now being produced in all sizes and pitches as a stock item by Shearcut Tool Co., Dept. B, 7045 Darby Ave., Reseda, Calif.

Tools are made with high spiral flutes, a design which was originated by this manufacturer several years ago. The high spiral flutes and cutting edges, lower torque requirements are claimed to give a longer life to the tools, and through higher speeds, cut production and labor costs.

Made from high speed steel and



ground from the solid after hardening, these tools should go a long way toward enabling American manufacturers to regain foreign trade which has been lost because of our inability to furnish products made to the metric measurements and standards now used in every country in the world with the exception of the United States, Canada and Great Britain.

Use ACTION Card, opposite page 64. Encircle No. 14

Coil cradle and straightening machines

A line of combination coil cradle and straightening machines, featuring compact construction to reduce floor area, handles coil weights from 2,000 lbs. up to 10,000 lbs. with widths from 8" to 24".

The cradle is conveyor type construction with guide plates that rotate with the coil to prevent crimping or damaging the edge of the material. The level-

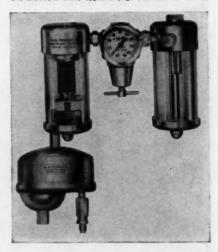
The M-B automatic air trap shown in combination with the M-B automatic air line filter, regulator and lubricator assembly. Trap is used in conjunction with either the M-B automatic air line filter, Model A-1, or the M-B Whirl-A-Way automatic air line filter, Model W-1. It is installed with these units by removing the drain cock on the filter and screwing the trap into place. An automatic water ejector for all air-line applications, it is claimed to assure dry air in pneumatic systems at all times, regardless of humidity or other contributing factors. M-B Products, Dept. B, 46 Victor Ave., Detroit 3, Mich.



ing or straightening unit is available with either five or seven power driven rolls and one or two sets of pinch rolls. All rolls are made of hardened alloy steel.

The coil cradle and straightening units are powered by a 4 to 1 variable speed drive; feeding speed from 30 to 120 fpm. The power is transmitted through a clutch mechanism to the leveling rolls, thus maintaining a proper tension at all times between the coil and leveling units, it is claimed. Brandes Press Co., Dept. B, 6408 Eurlid Ave., Cleveland 3. Ohio.

Use ACTION Card, opposite page 64. Encircle No. 15



Collet and chuck stop

An adapter used for drilling and tapping throughholes may be used with standard and step collets as well



as chucks. All moving parts of ejector are enclosed, eliminating the possibility of error caused by chips.

Setup time is claimed to be one minute. Workpiece is located in collet and locked in place. Stop is inserted, expander bolt tightened to lock in position. Connecting rod is advanced to contact workpiece; set screw is then tightened. B. L. Knapp Industries, Dept. BB, 107 N. Franklin St., Syracuse 2, N.Y.

Use ACTION Card, opposite page 64. Encircle No. 17

Bench surface grinder for small parts

The Sanford Model SG bench surface grinder is a precision machine of 4" x 8" x 6" capacity suited for dry surface grinding dies, gages, instrument parts and other parts small enough to fit in the palm of the hand. The machine may be adapted to wet grinding.

An exclusive method of assembling the grinding spindle, vertical column and bed is said to result in perfectly balanced alignment of these three main parts.

Specifications: magnetic chuck sur-



face, 3" x 5", longitudinal travel of table, 8"; transverse travel, 4"; vertical movement of wheel head, 6"; maximum distance between table and 4" wheel, 6"; spindle speed, approx. 5500 rpm. Sanford Mfg. Corp., Dept. BB, 1020 Commerce Ave., Union, N.J.

Plastic tooling compound

Plastik-Tul, a viscous, metal-filled plastic material which can be molded like putty to conform to almost any model or pattern and then hardened to produce a precision replica of the original, can be used for production of jigs, fixtures, plugs, gages, forming dies, holding fixtures, masking fixtures. It is especially applicable for making machining fixtures for odd and irregular shapes which ordinarily may be difficult to hold and/or position.

During the hardening process the compound requires no pressure and gives off no volatiles. When completely hardened, it is claimed to be corrosion-resistant and is not affected by common cutting oils, solvents, greases. It can be drilled, tapped, threaded, milled, broached, sawed with ordinary metal-working tools and equipment. It may also be painted or plated.

Type 100 is highly viscous and may be applied with a putty knife, spatula, etc., to vertical surfaces. Type 200 is slightly more fluid and should be used when it is desirable to pour the material into a form surrounding the model or pattern to be duplicated. Industrial Development & Mfg. Corp., Needham, Mass.

Use ACTION Card, opposite page 64, Encircle No. 18

Square gage blocks

The DoAll Co., Dept. BB, Des Plaines, Ill., has added square gage blocks to its line of gaging equipment. They have also developed a new system of square block accessories designed to extend the use of square gage blocks in practical everyday inspection tasks. Accessories can be used with all standard square blocks.

Claims made for the square block gaging system include: greater ease of acsembling square blocks into working gages; assembly of a greater variety of gages; inspection by indication rather

than by "feel".

Tie rods for assembling stacks of blocks interlock at ¼" increments by means of ratchet teeth milled on the rods. A rod of the desired dimension is obtained by laying one rod against the other to mate the ratchet at the desired point.

Flat caliper jaws with 1" and 3" extensions permit checks of outside diameters up to 5%". For checking inside

diameters, round caliper pins are held in the assembly with specially designed Vee blocks. This design permits turning of the pins to expose new gaging surfaces as they wear.

Special drilled and tapped gage blocks accommodate brackets for holding dial indicators in several positions, depending on the nature of the gaging task. The dial indicator can be end-mounted on the stack for use as an indicating pin gage, front-mounted for use as a comparator or side-mounted to check heights over protruding shoulders.

Use ACTION Card, opposite page 64. Encircle No. 19

Heavy duty tilting arbor saw

Model No. P3018 10" tilting arbor saw is operated from any standard 1 or 1½ hp motor. The saw is driven by a three groove arbor pulley with three matched V belts to utilize entire motor power output. Motor mounts directly beneath table surface. Saw has adjustable gibs. Heavy duty trunnions are claimed to provide continuous vibration-free operation.

Table top has improved front and rear locking rip fence that glides easily on extended tubular guide bars, a feature that permits fence to be moved 25½" to the right of blade, increasing table area to 44½". Duro Metal Products Co., Dept. BB, 2651 N. Kildare Ave., Chicago 39.

Use ACTION Card, opposits page 64. Encircle No. 20

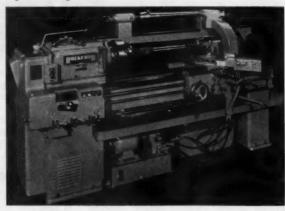


Tracer lathe has 12 spindle speeds

The Rockford tracer lathe is an all geared head, 18" engine lathe having 12 spindle speeds, 32 feed changes and bed lengths from 6' to 12'. It is powered by a 5 hp motor and spindle speeds up to 1140 rpm are available.

The tracer control is an adaptation of the company's "Kopy Kat" duplicator. An independent, sealed pumping unit, featuring a governor controlled pump, is

mounted directly under the chip pan, and takes a minimum amount of floor space. The tracer valve is mounted on an overarm at convenient operator height. All hydraulic lines from the valve pass



through the overarm and along the apron, clear of chips, coolant and work or operator interference at all times. The system operates at a maximum unit pressure of 400 psi and develops

USE THE CAPACITY FOR WHICH YOUR MACHINE IS DESIGNED



THE HANSON HOLDING FIXTURE is adaptable to Jig Borers, Jig Grinders, Vertical Mills, Duplicators etc. This fixture is permanently square and in-line with the ways of the machine. Therefore, its accuracy is unsurpassed in its application to Work Holding.

It need not be removed. To accommodate various jobs, simply loosen the Sliding Blocks and respace to the size required. Due to the precision, the Sliding Blocks are instantly re-located at any time.

It effects great savings in set up time as the Work Piece is aligned by the fixture, thereby eliminating the otherwise necessary indicating for squareness. Duplicate Pieces can be machined with the same accuracy as the original without duplicating the set-up time.

set-up time.

THE HANSON HOLDING FIXTURE eliminates distortion of the Work Piece due to its unique method of holding.



HANSON & COMPANY

6527 RUSSELL ST.

DETROIT 11, MICHIGAN

a total holding force of 1650 lbs.

The template carrier is mounted high enough for maximum operator visibility. Safety is increased inasmuch as there is no necessity to reach over rapidly revolving work or chuck. The template carrier is furnished for round masters which may be produced on the machine.

The tool slide is positioned on a 45° angle and permits a maximum diameter change up to 6" with a maximum work

swing of 10½" over the carriage. An automatic, feed throw-out clutch is standard equipment. Screw adjustment permits fine selection of the throw-out point, eliminating danger of work spoilage due to overtravel. A hinged chuck guard prevents coolant from being thrown away from the chuck.

The tracer lathe is instantly available for standard lathe work, without modification or dismantling of any kind,

"RFC" ROLL-FEEDS

FITS ANY PRESS

For side or rear feeding. All attachments for installing furnished, including disc and connecting linkage.

CAN'T SLIP

Each wedge has four points of contact to safeguard accuracy.

REVERSES INSTANTLY

Merely shift feed finger spring from one lug to the other.

FEEDS IN THOUSANDTHS

Amazingly accurate stock movement assured.

MAINTAINS ORIGINAL SETTING

Regardless of use or wear. No ratchets or pawls to wear down and "Throw off" feed spacing.

Ready for mounting! Furnished complete.

Write today for

EARLY DELIVERY ON STANDARD MODELS

Roll-Feeds Corporation

ASHTON, R. I.

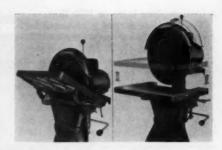
Encircle No. 443 on Card, Opposite Page 65

making it an exceptionally versatile tool, rugged enough for heavy production work and flexible enough for tool room or job shop work. Rockford Machine Tool Co., Dept. K, Rockford, Ill.

Use ACTION Card, opposite page 64. Engirele No. 21

Disc grinder and sander has high speed operation, safety features

The new Apex disc grinder and sander is claimed to introduce improve-





for the BEST in grinding

Once you've tried an Onsrud Air Turbine Grinder, you'll want no other kind. There's speed . . . and power to hold speed at full load . . . for smooth, fast work. Best of all, Onsrud Grinders are amazingly light in weight, run vibration-free, and never become even slightly warm. Exhaust air keeps the housing cool! Bearings grease packed for easy maintenance. Write for Bulletin 1129.

ONSRUD MACHINE WORKS, INC. 3908 Palmer St. • Chicago 47, III. Portable Tool Representatives Wanted Good Territories Available



TOP SPEED AND POWER



THREE SIZES



Encircle No. 444 on Card, Opposite Page 65
MACHINE and TOOL BLUE BOOK

ments for faster, easier operation, safety features, and longer life through less maintenance.

All operating controls are close to the operator's right hand. A forward and reverse switch is standard equipment for left and right hand jobs. The new disc guard cannot flip off, keeps fragments and dust out of operator's eyes, and rolls back when work is handled near top of disc. Guard cannot catch

work, it is claimed, and also exposes full face of disc.

All moving parts of the grinder are lubed with a dry lubricant that reportedly lasts the life of the machine. Motor has sealed bearings. Totally enclosed motors are available. The table has tapered bearings which are adjustable to eliminate end play. A counterbalance mechanism allows the table to be moved up and down in a single



Encircle No. 445 on Card, Opposite Page 65

motion, to expose the full disc surface. Once moved, it is aligned and locked in place by means of a single turn cam lock.

Grinder comes with 15" or 16" dia. disc and a 14" x 22" table. Motors range from ½ to 2 hp with 1800 rpm. Rankin Bros. Engineering & Sales Corp., Dept. B, 11104 S. Alameda, Lynwood, Calif.

Use ACTION Card, opposite page 64. Encircle No. 22

Carbide tipped reamer has five star features

Nelco has named its new carbidetipped reamers the five star as it incorporates the following five features: (1) Protected centers make regrinding sure and easy; (2) unequally spaced teeth eliminate vibration and chatter, improve finish on hole surfaces; (3) braze resists stress indefinitely, permits

When you want a "soft" hammer that's BETTER, SAFER
COSTS LESS AND
LASTS LONGER

That's when you want

Jawhead

They do more work with fewer blows! The secret—less rebound, longer striking contact. Faces won't slip, fly off, crack, or spark. Ideal for delicate parts, finishes. C/R Jawheads cost less. Buy C/R Jawhead from your local industrial supplier.

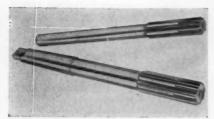
CHICAGO Rawhide MFG.CO.

1301 Elston Ave. Chicago 22, Illinois In Canada: Super Oil Seal Mfg. Ca., Ltd., Hamilton, Ontaria



Encircle No. 446 on Card, Opposite Page 65

MACHINE and TOOL BLUE BOOK



the use of harder grade carbide; (4)

extra long carbide tips; (5) hard chrome plate flutes on hardened tool steel body create an even, over-all surface for running in guide bushing.

Reamers are available in straight or taper shank, rough ground as well as finish ground to listed sizes. Nelco will custom-grind to specification. The Nelco Tool Company 268 Center St., Manchester, Conn.

Use ACTION Card, opposite page 64. Encircle No. 23



Power feed head vertical milling machine

The U.S. Burke power feed head vertical milling machine has 800 lb. of

down thrust on the guill.

Important features: infinitely variable feed from .002" to .008" per revolution; 5½" power quill travel; internally locked enclosed hard chrome plated quill; coarse and fine hand feeds as well as power feed; variable positioning of coarse feed lever and quill lock



handle; variability of feed rate while machine is in operation. The U. S. Burke Machine Tool Div., Dept. BB, Brotherton Rd., Cincinnati 27, Ohio.

Use ACTION Card, opposite page 64. Encircle No. 57

Centers have replaceable carbide tips

Grip-Tip centers consist of a holder and a replaceable carbide tip. The holder is made of tool steel and is available in several standard Brown & Sharpe, Morse and Jarno shank tapers. Solid carbide tips are available in 4" and 4" diameters and are accurate to .0005". Special shank tapers and tip



diameters can also be furnished.

Male or female carbide tips are inserted or removed from holders by simply turning a screw. An adjustable screw in shank of holders positions depth of carbide tips in holders. The unique clamping action of holders on tips is claimed to be positive and quick. Detroit Reamer & Tool Co., Dept. B, 2830 E. Seven Mile Rd., Detroit 34, Mich. Use ACTION Card. opposite page 64. Eneirste No. 62

Hand stamps for light metals

Permanent identification of the newer light metals may be safely stamped with a line of rounded face, low stress hand stamps, produced by Hoggson & Pettis Mfg. Co., Dept. BB, 141 Brewery St., New Haven, Conn.

The stamps indent, but do not cut or crack the metal under normal use, it is claimed. They are available in boxes of 9 figures or 27 letters, and in stock character sizes of 1/16", 3/32", 1/8", 3/16", and 1/4".

Use ACTION Card, opposite page 64, Encircle No. 64



Valve design changed

Design advancements in its 880 Series of hand and foot valves have been announced by Ross Operating Valve Company, Dept. 1902, 120 East Golden Gate, Detroit 3. Mich.

Valves are available with single foot treadle, double foot treadle, vertical hand lever or horizontal hand lever controls. They are easily changed from hand to foot operation. A separate base





UNITED STATES DRILL HEAD COMPANY

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for bottom or side ports is provided and an optional base is available to permit manifolding a series of bases to each other for simplified piping. The valves can be disconnected without disturbing the piping.

Pipe sizes include ¼" and ¾" in the three way and four way models. All models have standard two position locking action, but may be ordered with spring return or three position locking action. The pressure rating is 125 psig and the maximum recommended operating temperature is 175°F.

Use ACTION Card, opposite page 64. Encircle No. 25

Duplex type universal optical comparator

A duplex type universal optical comparator has a compact design which incorporates the basic features required for both tool room or production line inspection. The instrument may be used



FOR DRILLING, CORE DRILLING, ROUGH AND FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.

42326 ANN ARBOR ROAD, U.S. 12, PLYMOUTH, MICH.
Telephone PLYMOUTH 1472

Encircle No. 449 on Card, Opposite Page 65
MACHINE and TOOL BLUE BOOK



on a shop bench or stand in either a vertical or horizontal position. This dual design feature allows parts to be positioned in either plane.

The slide type insertion screen frame accommodates standard 8½" by 11" overlay charts and is provided with retainer rails and screen clips. The large plain platform type stage measures 5" by 7".

The high intensity lamp house in-(Continued on Page 311)



These complete* ready-made units are available on short delivery to help solve your automation problems NOW.

*furnished with drive and motor

STANDARD UNITS:

20" — 30" — 40" Turret dia. 6 — 8 — 16 — 24 — 32 work stations.

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 Self-centering holding vise.
- Automatic depth regulator.
 Adjustable copy holders.

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NEW HERMES ENGRAVING MACHINE CORP.

13-19 University Pl.. New York 3, N. Y.



Literature

CATALOGS AND BULLETINS AVAILABLE FROM MANUFACTURERS

For copies of the literature in which you have an interest use the postage-paid postcard on the next page. Merely circle the identifying number and mail the postcard.

- 1. Collet Control. By combining mechanical leverage with air power, complete control of the opening and closing of the Adams collet is assured. Description of the new concept of collet control may be found in a leaflet recently issued by Adams Equipment Co., Dept. BB, 4200 Burbank Blvd., Burbank, Calif.
- 2. Lubricants. Molykote lubricants are discussed in two leaflets available from The Alpha Corporation, Dept. MB, 65 Harvard Ave., Stamford, Conn. Field Report No. 140 contains excerpts from an article entitled, "New Methods for Engine and Compressor Maintenance," By Robert S. Ridgeway, Standard Oil Company of California. Bulletin No. 102 describes in complete detail the functions of MOLY-Spray-KOTE, a new dry lubricating film, and its advantages in industry.
- Atomic Energy. Prosposals for an industrial research reactor facility owned and operated by industry for industry have been set forth in a brochure en-

- titled, "Neutrons for Industrial Research." Copies are available from the Atomic Energy Dept., Eng. Division, American Machine and Foundry Co., Dept. MBB, AMF Building, 261 Madison Ave., New York City 16, N.Y.
- 4. Steel Pulleys. The American Pulley Co., Dept. B, 4200-B Wissahickon Ave., Philadelphia 29, Pa., has recently produced a colorful 16-page brochure on the manufacture and uses of steel pulleys. Individual engineering catalogs on the products covered are also available.
- 5. American Standards. The 1955 edition of "A List of American Standards" lists and indexes about 1500 American Standards. There are 210 for construction and civil engineering, 153 mechanical, 272 electrical, 158 safety, etc. A separate section on consumer goods is included. Write The American Standards Association, Dept. MB, 70 East 45th St., New York City 17.
- 6. Bar Feed. Hydra-Lite bar feed for screw machines eliminates feed fingers,

This Helpful Literature Now Available Sent Free Upon Return of Postal Card

On Opposite Page

increases production, and assures positive precision. A circular on this economical hydraulically operated bar feed is available from Boyar-Schultz Corp., Dept. BB, 2108 W. Walnut St., Chicago 12. Ill.

7. Taps. A simplified guide to the new tap marking system is included in a new tap catalog issued by Besly-Welles Corp., Dept. MBB, 122 Dearborn Ave., Beloit, Wis. An easy-to-understand graph shows how the new system establishes the various classes of fits in sizes from 0-80 through 1½" diameters. The complete line of Besly Taps is illustrated in Catalog No. 80.

8. Grinding Wheels. The Geo. H. Bullard Co., Inc., Dept. MBM, 40 Donald St., Westboro, Mass., specialists in grinding wheels, have recently issued a manual on new simplified list prices. The manual has been so constructed that the list price of all standard sizes and shapes of grinding wheels can be determined by a single reference to the proper page. Also included is a grinding wheel marking chart.

Countersinks. New listings of combined drills and countersinks with spiral flutes have been made available in a leaflet available from Chicago-Latrobe, Dept. BB, 411-B W. Ontario St., Chicago 10, Ill.

10. Cast Alloy Cutting Tools. Special advantages of cast alloy cutting tools and descriptions of the three grades of Crobalt cast alloy are outlined in the comprehensive Catalog No. 55 just released by Crobalt, Inc., Dept. MB, 2800 S. State St., Ann Arbor, Mich. Tools listed include solid square, rectangular and round tool bits, solid cutoff blades, tipped tool bits, and inserts for vertical tool holders.

11. Milling Machines. HyPowermatic

milling machines are pictorially presented in a new brochure published by the Cincinnati Milling Machine Co., Dept. BB, Cincinnati 9, Ohio. HyPowermatics are heavy duty fixed bed types, specially designed for continuous operation on medium to large size parts. Dimensional drawings and specifications of both the plain and duplex styles are included.

12. Sanders. A completely new dual action sander which can also serve as a rougher and finisher is announced in a flyer issued by the Detroit Surfacing Machine Co., Dept. BBM, 1331 E. 8-Mile Rd., Detroit 20, Mich. Model D. A. Easy Dual Action Sander complete with felt pad, retails for \$69.50.

13. Tool Bits. Molybdenum, tungsten, and cobalt high speed bits, finished ground and unground, are listed in a new leaflet offered by The DoAll Company, Box B, Des Plaines, Ill. Suggestions for proper grinding and mounting of bits are added features.

14. Folder Brakes. Appliance manufacturers will be interested in the new brochure released on folder brakes by Dreis & Krump Manufacturing Co., Dept. B, 7440 S. Loomis Blvd., Chicago 36, Ill. The brochure features both single wing and double wing machines and includes information on custom built models.

15. Carbide Tools. A new 12 page catalog published by the Essex Rotary File & Tool Corp., Dept. B, 295 Madison Ave., New York 17, N.Y., includes the complete Essex line of carbide tools—burrs, end mills, reamers, grinding burrs, burr sets, and special tools. Additional features are speed and fluting charts and a section on high speed steel tools. 16. Lubricants. A circular designed to serve as a ready reference to lubricat-

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MAY, 1955

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ing problems in the metal working field released by Fiske Bros. Refining Co., Lubriplate Div. B, 129 Lockwood St., Newark 5, N.J. Characteristics and suggestions for use of the various cutting oils, soluble oils and compounds are described.

- 17. Worm Gear Sets. Foote Bros. Gear and Machine Corp., Dept. BB, 4545 S. Western Ave., Chicago 9, Ill., has now cataloged a standard line of worm gear sets. These sets which will have applications in cranes and hoists, machine tools, and other equipment with shock load or uniform load characteristics are illustrated in a 24-page catalog (Engineering Manual SW No. 1). Ratings and specifications included.
- 18. Combination Hydraulic Forcing and Straightening Press. "Two machines in one" by simply inter-changing one Quick-Change Table with another. To introduce this combination hydraulic forcing and straightening press, a recent addition to the line of the Stanley H. Holmes Co., 3300 W. Lake St., Dept. BB, Chicago 24, Ill., the company has prepared a comprehensive specifications manual. Illustrations, blue prints, specifications, engineering data and formulas are included.
- 19. Muffle Furnaces. Designed for high efficiency and years of dependable service. The Hevi Duty Alloy 10 muffle furnace manufactured by Hevi Duty Electric Co., Dept. MBM, 4212-B W. Highland Blvd., Milwaukee 1, Wis., is described in Bulletin 954. A feature of the furnace is the simplified temperature control.
- 20. Lathe Chuck. A combination catalog and net price selector designated as Catalog No. W-200 issued by The Horton Chuck Division, Dept. B, The E. Horton & Son Co., Windsor Locks, Conn., features visual selection of the

desired chuck by immediately locating the model and model number, type and number of jaws, chuck size, spindle nose and net price all in a few seconds.

- 21. Heavy Duty Lathe. A 26-page illustrated bulletin introducing the series 90 DynaShift lathe featuring a new type headstock drive has been released by The Monarch Machine Tool Co., Box BB, Sidney, Ohio. Requests for Bulletin No. 1601 should be sent on business letterhead.
- 22. Shipping Bags. Small metal parts of non-fragile or semi-fragile nature are shipped in Jiffy Bags at a great saving in time, labor, and packaging materials. Information on this packaging method is explained in a leaflet issued by the Jiffy Manufacturing Co., Dept. MB, 360 Florence Ave., Hillside, N. J.
- 23. Push Button Lathe. Toolroom, laboratory, and production departments will find many new construction improvements, operational features, and controls for rapid, accurate, repeat production on the Hardinge HLV high speed precision lathe. The illustrated 24-page Bulletin HLV has been released by Hardinge Brothers, Inc., Dept. BB, Elmira, N.Y.
- 24. Hydroform. Design and specifications of Hydroform, a deep drawing machine for simple and intricate shapes manufactured by The Cincinnati Milling Machine Co., Dept. MT, Cincinnati 9, Ohio, are contained in Publication No. M-1759-3. Although the benefits of Hydroforming apply especially to short runs and development work, its wide application in many industries is graphically pictured in the brochure.
- 25. Surface Grinder. Engineered and manufactured in Italy the Gagemaster, Model 2HF 6"x18" hand feed surface

grinder, is being distributed by the H. Leach Machinery Corp., Dept. B, 387 Charles St., Providence 4, R.I. Leaflet illustrates and describes this grinding machine suitable for precision toolroom or production grinding.

26. Drilling Machine. A comprehensive, illustrated bulletin No. 160 describes the new Edlund Model 1F sensitive drilling machine and contains information on all cost cutting features including vari-speed drive, micrometer graduated depth control, and spindle tension control. The informative bulletin was prepared by the Edlund Machinery Co., Dept. MTB, 20 Huntington Ave., Cortland 20, N.Y.

27. Air Power Systems. A six-page engineering service bulletin, Form 213-A, entitled, "A Better Air Power System," prepared by Ingersoll-Rand Co., 11 Broadway, Dept. B, New York 4, N. Y., points out that power losses in compressed air lines are frequently as much as 30- to 50 percent. Procedures are outlined on how to bring system up to accepted standards.

28. Air Gun. The Milair air gun with fully controlled air pressure is manufactured by the Milwaukee Air Gun Co., Dept. BB, 1824-B N. 32nd St., Milwaukee 8, Wis. The air gun which is fully guaranteed, self cleaning, economical, and compact is described in a new leaflet released by the manufacturer.

29. Wire Chart. A unique wall size wire chart, a handy reference for split gauges in decimal sizes, is offered by the Mettler Machine Tool, Inc., Dept. MB, 19 Congress Ave., New Haven, Conn., manufacturers of Shuster wire straightening and cut-off machines.

30. Reinforced Plastics Tooling. Based on actual operation in tool and die shops actively engaged in reinforced plastic tooling, a 20-page handbook, "Manual for Reinforced Plastic Tooling," prepared by the Marblette Corporation, Dept. BB, 37-21B 30th St., Long Island City 1, N.Y., is described as the first authoritative technical guide to this phase of industrial production. Requests for the manual should be made on company letterheads.

31. Hydraulic Standards. The Miller Fluid Power Company, Dept. B, 2040 N. Hawthorne Ave., Melrose Park, Ill., announces three new bulletins: J.I.C. Hydraulic Standards for Industrial Equipment—a revised, up-to-date issue which presents the "Standards" in complete, unabridge form; Bulletin H-104K on high pressure Hydraulic Cylinders—contains data on Miller's complete line of heavy duty cylinders; Bulletin A-105K on Air Cylinders—contains design, construction, and engineering and mounting data on Miller 200 psi heavy duty air cylinders.

32. Forged High Speed Steel Tools. A new folder describing in detail why forged high speed steel tools are guaranteed to outlast and outperform conventional high speed steel tools is offered by the Modern Tools Division, Dept. B., Nelco Tool Co., Inc., 268 Center St., Manchester, Conn.

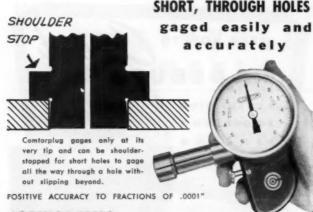
33. Dynamic Response calls for an entirely new approach in motor design. The Reliance Electric and Engineering Co., Dept. MTB, 1068 Ivanhoe Rd., Cleveland 10, Ohio, announces a new "T" Line of direct-current motors. How the "T" Line Motor fulfills the basic re-

quirements for Dynamic Response is set forth in a 12-page brochure issued by the company.

34. Armature Turning Lathe. Rivett Model 1AL, engineered for the sole purpose of turning armatures of small fractional h.p. motors, is illustrated in a bulletin by Rivett Lathe & Grinder, Inc., Dept. BB, Brighton 35, Boston, Mass. Method of operation is described

and illustrated.

35. Surface Grinder. Adapted for accuracy on small intricate parts, Sanford Model SG bench surface grinder is fully explained in a new brochure issued by the manufacturer. Specifications for Model MG micro grinder, a larger heavier duty surface grinder, are also given in the publication available from The Sanford Manufacturing Corp.,



COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/4" to 8" dia.

UNIQUE ADVANTAGES

Positive gaging accuracy to fraction of ,0001" regardless of who operates it.

Indicates actual size, a fixed not passing—reading. Positive 2-point gaging—auto-

matic centering.

Shallow holes, deep holes, inside splines, open-end holes gaged easily.

Detects ovality, back or front taper, bell mouth, barrel shape. Reaches to bottom of blind holes. Gages work while still held in chuck.

A shop tool for all-day every day use.

Portable—no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, guided missile, farm machinery, automotive transmission, household appliance, and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . at machine . . . at inspection bench . . . for selective assembly. No other like it—investigate and see why.

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62 Farwell Street Waltham 54, Massachusetts



GET THE FACTS—REQUEST BULLETIN 48

Dept. MBB, 1026A Commerce Ave., Union, N. J.

36. Remote Control Systems. A 20-page Design Manual, No. 553, intended to serve as a guide in the design, selection, and installation of remote control systems for valves and other types of equipment actuated by rotating shafts has just been published by the Stow Manufacturing Co., Dept. BB, 30 Shear St., Binghamton, N.Y. It contains com-

plete data on flexible shafting, standardized valve operating gear for reach rods, and the new geared joints.

37. Solenoid-Operated Valves. Said to be the most complete catalog published on solenoid-operated valves, the Skinner Electric Valve Division, Dept. B, The Skinner Chuck Company, 95 Edgewood Ave., New Britain, Conn., is offering the new general catalog on its line of valves to the machine tool industry.



one pass, enabling operator to have one hand free for stock handling. Small and compact, the Pines machine is equipped with quick, interchangeable tool holders, chuck inserts, 8-speed sheave (760 to 3920 rpm), sturdy spindle, and grease-sealed precision bearings. The No. 600 unit illustrated, handles stock diameters up to 2". Maximum feed stroke is 1½". Automatic air-operated units are also available for higher production work.



and larger models for stock sizes up to 5".

PRUDUCTION SENDING - DESURBING - CHAMPERING MACHINERY

Write FOR FREE BULLETIN

Write for facts on how these machines cut costs on a wide range of work. Five basic Skinner electric valves are described and possible variations are discussed. An accompanying price list is cross indexed for quick reference.

38. Power Press. The Sales Service Machine Tool Co., Dept. MTB, 2357 University Ave., St. Paul 14, Minn., announces a recent addition to the Press-Rite Power Press family-the No. 45. General description and tabulated specifications are embodied in a new bulletin.

39. Electric Ovens and furnaces and related equipment are described in literature released by Soiltest, Inc., Dept. MB, 4520 W. North Ave., Chicago 39, Ill. Included is a bulletin on The Techkote Air Meter which retails for \$183.50, F.O.B. Chicago.

40. Noncorrosive Lubricant. Especially

100 TO 40,000 POUND COIL CAPACITY

LITTELL REELS

Whether you feed stock from 100 pound coils or 40,000 pound coils, there is a Littell **Automatic Centering** Reel to meet your needs . . . motor driven, electric brake and plain brake reels. Every Littell Reel is designed for swift, safe coil replacement and smooth, controlled uncoiling. All models combine smooth

No. 25-18-Littell Motor Driven Automatic Centering Reel With Arm Control. Coil Capacity,

Ask for a Littell Coil Weight Calculator

2,500 lbs.

Write for Littell Reel Catalog Data

years of dependable service.

running accuracy with rugged

construction that assures extra

with Safety

ROLL FEEDS - DIAL FEEDS STRAIGHTENING MACHINES . AIR BLAST VALVES

4147 N. RAVENSWOOD AVE., CHICAGO 13, ILL.

compounded to eliminate "stick-slip" or "jumpy table," Sunoco Way Lubricant which has outstanding metal-wetting and adhesive properties and excellent extreme-pressure qualities is described in a new technical bulletin No. 28 by The Sun Oil Co., Dept. B, 1608-B Walnut St., Philadelphia 3, Pa.

41. Tracer Control. One automatic cycle produces ruff, semi-finish and finish

cuts when the automatic multi-cycle tracer control attachment is used on the Sundstrand Automatic Lathes. Complete description and illustrations of the attachment are included in the new bulletin, Form No. TR-1, issued by Sundstrand Machine Tool Co., Dept. B, 2535 11th St., Rockford, Ill.

42. Aircraft Drills. High speed aircraft extension and threaded shaft drills manufactured by Whitman & Barnes,

Look to the Future



Originators of the vertical ball-bearing machine tool motor driven coolant pump, Ruthman has maintained its reputation for excellence during the years by constant attention to quality, performance, and flexibility to customer requirements. In the future, as in the past, you can count on Ruthman to pioneer improvements and refinements that will make the Gusher an even better and more efficient pump for you.

THE RUTHMA



1816 READING ROAD

CINCINNATI, OHIO

Dept. B, 40045 Plymouth Rd., Plymouth, Mich. are described in a recently published circular. Specifications and prices are included.

43. Holders for "Throw-Away" Carbide Inserts. Bulletin No. 552-M available from The Wesson Company, Dept. B, 1220 Woodward Heights Blvd., Ferndale 20, Mich., describes and illustrates the advantages and mechanical features of

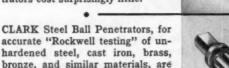
the new Multicut series of holders for "throw-away" carbide inserts. Separate tables for each holder give the sizes available, shank dimensions, prices of the holders only, insert catalog numbers and insert dimensions.

44. Band Saws. Included in their brochure of band saws featuring variable speed drive as standard equipment is the announcement by W. F. Wells &

Call on CLARK

for All Your "Rockwell Testing" Needs

CLARK Diamond Cone Penetrators are exactly right for your "Rock-well" hardness tester, whether or not it bears the CLARK name. Every step in their manufacture, from careful diamond selection to expert lapping, leads to a precision product that will give you precision results. Yet CLARK Diamond Penetrators cost surprisingly little.

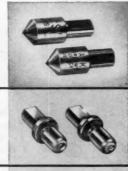


CLARK Test Blocks, in various hardness grades, provide a quick, sure, and simple method of checking the accuracy of your "Rockwell" type hardness tester.

available in all standard sizes.

Write today for descriptions and prices.









Sons, Dept. MBM, 707 Coolidge Ave., Three Rivers, Mich., of their new Model "A"—a small saw with large capacity. Specifications and descriptions are given for all models illustrated.

45. Tap Saver. A low set-up time is one of the advantages of the Vulcan radial relief tap saver and cutter grinding fixture. Other advantages of this low cost fixture are described in the new leaflet

issued by the Vulcan Machine Co., Dept. BB, 71 E. Third St., Waynesboro, Pa.

46. Gas Welding. A new welding process booklet B-6525, "West-ing-arc," explains the performance and applications of a new consumable electrode inert gas welding process. The Westinghouse Electric Corp., Dept. MB, 401 Liberty Ave., Box 2278, Pittsburgh 30, Pa.



47. Amplifying Comparator. Announcement of the addition of the "Millimess" amplifying comparator to their line of precision gages has been made by the George Scherr Company, Inc., Dept. BB, 200-B Lafayette St., New York 12, N.Y. Description of this super-sensitive indicator which sells for \$85.00 is given in a newly released flyer.

48. Squirrel-Cage Motors. Full tape in-

sulation provides the ultimate of protection against electrical failures in the motors manufactured by S. A. Woods Machine Co., Motor Division B, 27 Damrell St., Boston 27, Mass. A brochure on the various types of ball bearing squirrel-cage motors may be obtained upon request.

49. Trimming Equipment. The Brehm Division of Steel Products Engineering Co., Dept. BB, 100 W. Columbia St.,



Feeding parts of almost every shape and material—at controllable rates—single file—in oriented position—Syntron Parts Feeders provide the most efficient and economical method yet developed for full production feeding of parts in automatic processing set-ups. Electromagnetic operation—no mechanical wearing parts—easy to install.

Write for FREE Catalogue Data SYNTRON COMPANY
300 Lexington Ave. Homer City, Pa

Springfield, Ohio, has issued a 12-page catalog, "Brehm Trimming Equipment," presenting data on their trimming die and trimming press. The catalog illustrates machines available as well as shows the application of equipment in the metal working industry.

50. Uranium Mining. "Mesa Miracle" has been prepared by the United States Vanadium Company, Dept. B, 30 E. 42nd St., New York 17, N.Y., to indicate the tremendous importance of the Colorado Plateau to the nation's great atomic energy program. This 36-page booklet, amply illustrated with actual photographs, traces the uranium deposits from their source, through discovery, mining, and uses in the vast atomic energy program as well as uses in industry and medicine.

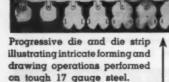
PROGRESSIVE DIES by B. Jahm

AUTOMATION TO YOUR PRODUCTION

TRANSFORM RAW STRIPS TO MICRO-TOLERANT COMPONENTS
—OR COMPLETE ASSEMBLIES—IN SECONDS FLAT!

True Automation — piercing . . . forming . . . swaging . . . coining . . . blanking . . . and trimming — with no intermediate steps or inspection — is possible in one press operation with B. Jahn progressive dies. From raw material to finished piece, B. Jahn dies perform precisely, uniformly — cutting unit time and unit cost with every press stroke.





Send today for the fact-filled "Story of B. Jahn Dies".

B. Jahn devised and built a 10 station progressive die that operated at 70 strokes per minute — delivered 2 pieces per stroke — on α production run of millions!

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

Encircle No. 459 on Card, Opposite Page 65

(Continued from page 297)

cludes special condenser lenses claimed to provide uniform illumination over the entire screen work area. No hoods are required regardless of general lighting conditions. Lenses to provide magnifications of 10X, 15X, 20X, 25X, 31\(^4X\) and 50X are obtainable. Overall dimensions are: length 31", depth 17\(^4\)", width 11\(^4\)", stage area 5" x 7\(^3\)", center line of lens system to stage 5" and weight 40 lb. Portman Instrument Co. Inc.

Dept. B, Town Dock Rd., New Rochelle, N.Y.

Use ACTION Card, opposite page 64, Encircle No. 26

Space-saving cylinder

An air, water, and low pressure hydraulic cylinder offers the maximum in space-saving by utilizing mountings only as wide as the actual cylinder body.

Mounting attachments are fastened in a normal manner to aluminum cylin-



411 VINELAND ST., BASSETT, CALIF. . KANSAS CITY, MO. BRANCH: CONGRESS BLDG., 3527 BROADWAY

Adjustable Automatic Stock



Write for Autostop-Tap Guide Bulletin.

BRANCH

MFG. CO.

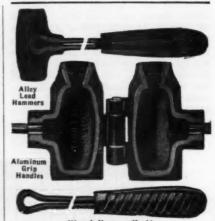
12 Oison Road North Branch, Minneseta



Encircle No. 461 on Card, Opposite Page 65



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Hinged Hammer Moulds

1, 2½ and 5 lb. sizes—order your alloy lead hammer requirements from your machine tool supply house

or direct from:

KITZMAN MFG. CO.

15061 Hartwell Ave.

Detroit 27, Mich.

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MACHINE and TOOL BLUE BOOK



der heads with heat treated socket head cap screws. Stainless steel piston rods and aluminum pistons fitted with standard O rings ride in a hard drawn brass cylinder tube with a special inside diameter finishing process.

There are four standard models in diameter sizes of 1½, 2, 3, 4-inches. Air maximum operational pressure is 160 pounds per square inch, while maximum pressure for hydraulic use is 360 pounds per square inch. Rotex Punch Company, Dept. B, 2350 Alvarado, San Leandro, Calif.

Use ACTION Card, opposite page 64. Encircle No. 27

Punch and die retainers

A retainer of improved design for use with ring punches and Type R dies includes several time and cost saving features.

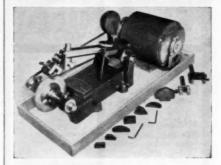
Ductile iron used in these retainers is claimed to have great strength and



Carbide Users

CAN NOW RESTORE BROKEN TOOLS AND CUTTERS QUICKLY AND INEXPENSIVELY WITH THE NEW IMPROVED MODEL NO. 300-A.

UNION CUT-OFF MACHINE



WHAT IT DOES:

Cuts broken sections off damaged carbide tools without grinding.
Cuts standard carbide blanks to any desired

size.
Saves time-consuming grinding on carbide tools.

Saves carbide tools that otherwise would be scrapped.

scrapped.
Saves you money on costly diamond grinding wheels.

Saves you money by making possible the purchase of large-size standard carbide blanks. Simple to operate and automatic in operation.

SPECIFICATIONS and PRICE:

1/4 H.P. Motor, 1725 R.P.M., 110 Volt.
Overall size 10"x21"x9" high, Supplied complete with diamond cut-off blade, universal double clamp and motor for \$295.00 F.O.B. Stamford, Conn.
Clamps for special applications extra at \$7.50 each.

LITERATURE ON REQUEST

WIRE DIE CORP. 71 W. 45TH ST., NEW YORK 36, N. Y. PLANT: STAMFORD, CONNECTICUT

Buy W

PRESS ROOM EQUIPMENT

WIRE STRAIGHTENERS

Takes round or flat wire end tubing. Rolls adjustable by means of socket set screw. For use with automatic Slide, Roll or Hitch Feeds. Units available with 5, 7, 9 or 11 grooved rolls.



MOTOR DRIVEN STOCK STRAIGHTENERS

For all thin materials, Entering rolls power driven; top rolls are individually adjustable for stock thickness. Available in eight sizes.



SWEEP GUARDS

A positive safety guard on power presses. Easily installed. Downward motion of ram removes operator's hands. Rugged—withstands jurring impact of press. Needle bearings in guard housings assures long life.

Write Now for new catalog showing prices and complete line of Equipment.



DURANT Tool Supply Co.

136 SOUTH WATER STREET, PROVIDENCE 3, R. I.

shock resisting qualities. It is easily machinable by die makers for minimum center distances where required.

The design of punch retainers allows a choice of two methods of mounting: (1) by using as furnished and mounting from top of punch holder; (2) by drilling out tapped holes in retainer to provide clearance for %" screws, and mounting in tapped holes in punch holder. Punch retainers are furnished with 19/64 holes to be reamed at assembly for 5/16 dowels, Screw holes are tapped %—16 and counterbored.

Die retainers are furnished with 19/64 holes to be reamed at assembly for 5/16 dowels. Screw holes are drilled and counterbored to provide clearance for %" screws.

Both punch and die retainers are available in the keyed type, No. 2, for positioning of irregularly shaped punches and dies. Ring Punch & Die Co., Dept. BB, 108 Foote Ave., Jamestown, N.Y.

Use ACTION Card, opposite page 64, Encircle No. 28

Combination live center sets have large work handling capacity

A new Repco combination live center set, designed to handle a broad range of work, has been announced by Rockford Engineered Products Co., Dept. BB, Rockford, Ill. The live center, with



a set of six adaptors, provides a range from a point to a 6¼" dia. bell, and comes in a rack for storage. Individual centers are also available as required.

A quick lock feature enables the entire assembly to be locked for changing or regrinding and for specific jobs where dead centers are required. The bell centers are easily secured by a button head socket cap screw. They are designed with less overhang, which is claimed to result in greater rigidity, give more support to work and enable an operator to hold closer tolerances.

Use ACTION Card, Opposite page 64. Engirele No. 29

Decorative cabinet latch

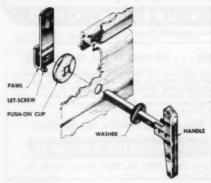
Decorative cabinet latch installed in single hole

The Southco universal cabinet latch is readily fitted to any panel thickness up to 1¾". Pawl is adjustable to frame thickness with a single set-screw.

Installation requires drilling only one ¼" hole in the door or panel, inserting and slipping a speed clip over the shaft, and attaching the pawl to the desired grip length. Once hole is drilled, complete assembly and fitting of latch takes about nine seconds, with a screwdriver the only tool used.

Attractive, modern appearance and nickel-plate finish make this fastener suitable for many types of cabinet doors. Southco Division, Dept. BB, South Chester Corp., Lester 13, Pa.

Use ACTION Card. opposite page 64. Encircle No. 30





AIR GRINDERS

MODEL JA
50,000 R.P.M.

\$4200
IN U.S.A.

Weight 12 ounces;
length 6½ inches;
chuck size ½ inch.
Wheel guard removed
for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.



MADISON-KIPP CORP.

207 Waubesa St., Madison IO, Wis., U.S.A.



Multifor BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complets with full assortment of dies and mandrels to punch, bend and cut round or flat brass, brenze, aluminum, steel, etc., up to 1/2 "x 4" x 4".

J. A. RICHARDS CO.

Encircle No. 468 on Card, Opposite Page 65



Sole Agents Model SHU

KARL A. NEISE Dept. BB, 404 4th Ave., N.Y. 16, N.Y.

A NEW TYPE WALTER PRECISION DIVIDING HEAD

- · Operates Horizontally, Vertically,
- · Easy Handling.
- . For Quick, Plain and Degree Indexing.
- Versatility Increased by Various Accessories
- · High, Long-lasting Precision.

Each tool supplied with individual test report. Max. permiss. error chart supplied with literature.

Encircle No. 469 on Card, Opposite Page 65



You Need an Extra Hand Now
to Speed Up Production!
HEIMANN TRANSFER SCREW SETS

Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive honds on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money tool

HEIMANN MFG., CO. ● URBANA, OHIO

Encircle No. 470 on Card, Opposite Page 65

So many standard styles . . . one must be just right for you!



For 68 years we have been producing metal-working tools and adding to our standard line. Teday we have PUNCHES and DIES in a large range of round, flat, oval, and square sizes to fit most makes of punch presses immediately available from stock at regular lew, standard prices.

Send for our complete catalog sheets.

T. H. LEWTHWAITE MACHINE CO.

312 East 47th St., New York 17, N. Y.

Coil cradle of 4000 lb. capacity handles 32" stock

A Koil Kradle of 4000 lb. capacity has been announced by Benchmaster Mfg. Co., Dept. BB, Gardena, Calif.

It accommodates coil stock up to 32" wide and 60" dia.; supplies a loop from which a machine can freely draw with



automatic feeding devices. The model illustrated will maintain a loop operating intermittently or operating continuously at any selected speed, adjusted by means of a varidrive unit. The cradle can be used in conjunction with punch presses, shears, roll forming equipment, slitters and similar machines.

Use ACTION Card, opposite page 64, Encircle No. 33

Hydraulic forcing and straightening press

The Holmes combination hydraulic forcing and straightening press serves two machines in one. By removing four bolts and replacing one quick-change table with another, the press will do either forcing or straightening, depending on the table used.

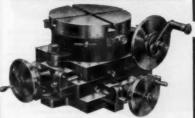
The interchangeable manifold has only four connections. If need be, complete hydraulic valve system can readily



Encircle No. 472 on Card, Opposite Page 65

SINCE 1925

Showing 71/2" Dial Type Rotary Table Mounted on compound table No. 1 Traverse and Circular Movements-



Made in larger size 12" dial type Rotary-compound table No. 2. Either unit usable separately. Five sizes of Rotary Tables. Adjustable tilting tables. Multiple spindle index centers. Screw head slotters. Vises. Write for Bulletins

The JOHN B. STEVENS Company SOMERSVILLE, CONN.

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When you think of small END MILLS - shink of

MICRO MINIATURES

Save Small End Mill Breakage

PRECISION GROUND FROM SOLID!

- Faster Cutting
- Long Life
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- Strength

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Encircle No. 474 on Card, Opposite Page 65

Sensational new VIBRA-FORGE' principle assures

unbreakable welds every time! BREN WELD

PORTABLE BAND SAW BLADE

WELDER .. With Built-in Grinder



\$169.50 Write today for

If you've been troubled with band saw blade breakage investigate this Bren/Weld unit built on the new Vibra-Forge prin-ciple. It gives you:

3/4" capacity

- · PERFECT WELDS.
- NO EREAKAGE.
 NO FAILURES.
 WEIGHS ONLY 35 LBS.
 OPERATES ON 110 V, AC.
 - UNCONDITIONALLY

*Pat. appl'd for

PRICE complete details Mfg'd by Brennen, Bucci & Weber, Inc., N.Y.C. SALES DIVISION

KASSON DIE & MOTOR CORP. Integrity Since 1919
32-14 Northern Blvd., Long Island City 1, N. Y.

Encircle No. 475 on Card, Opposite Page 65



be removed and replaced. The use of O-ring gasket-mounted valves eliminates the need for pipes. Instead, oil flows through the drilled manifold plate. There is no between-port leakage.

Press is equipped with a swing-out motor and pump panel. By removing two bolts, the hinged panel can be lowered to a horizontal position, making the motor and pump power unit accessible for inspection, maintenance. Models range from 5 tons to 150 tons. Stanley H. Holmes Co., Dept. BB, 3300 W. Lake St., Chicago 24, Ill.

Use ACTION Card, opposite page 64, Encircle No. 34

Special horizontal speed lathe

A special horizontal speed lathe, originally designed for manually removing defects from jet engine compressor wheels, has found a place in the automotive industry polishing axle shafts, torsion bars, and other parts.

It consists of a cabinet base, a head stock and a tail stock. The spindle is hardened and ground and rotates on antifriction bearings encased in a special cartridge type housing. The spindle nose can be made to suit customer requirements. A combination flywheel and hand wheel is provided

1219



which serves to give a uniformity of rotation and for manual turning of the work spindle.

A dry disc clutch is mounted on the spindle and is disengaged by means of a hand lever mounted on the side of the head stock. The work spindle is driven by multiple V-belts through a reduction unit which provides stepless spindle rpm ranging from 50 to 300. The spindle rpm control is mounted on the side of the head stock. This speed control permits the same surface work speed to be maintained from the inner to the outer diameters of the work piece. The tail stock is a conventional quick clamping type and designed for heavy duty work. Overall dimensions of the machine are 130 x 37 x 52 inches high. Acme Mfg. Co., Dept. B, 1400 E. Nine Mile Rd., Detroit, Mich.

Use ACTION Card, opposite page 64, Encircle No. 35

Improved vertical milling machine

No. 5VA Vertimil retains the spindle and ram head design of the earlier No. 5V, as well as the tilting spindle head and tilting table features.

The knee is new, and is operated electronically by a 3 hp direct current Reliance variable speed drive which comes complete with an ac-dc rectifier panel. Table feed speed range (both cross and longitudinal) is from .250" to 100" per minute in two simple stages, continuously variable in each stage. Vertical table feed speed range is from .070" to 38" per minute, also continuously variable in each of two simple stages. Rapid traverse up to 100" per



Hammond Machinery Builders

1614 Douglas Avenue Kalamazoe, Michigan Encircle No. 476 on Cord, Opposite Page 65

PORTABLE ELEVATING TABLE



Saves TIME and LABOR

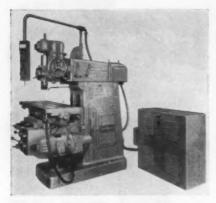
Eliminate heavy lifting and cut handling costs. Slight foot pressure varies height from 31" to 46½", leaving operator's hands free. Table swivels and locks in any position.

Our major services — Designing and Building — Dies, jigs, fixtures and special machinery.

SEND TODAY FOR ILLUSTRATED CATALOG No. 2

THE MIDWEST TOOL & ENG. CO.

Encircle No. 477 on Card, Opposite Page 65



minute is provided by engaging the rapid traverse button located on the pendant type control station, Releasing the push button will return the feed to its preset feed.

The 5VA is available with either 5,

10 or 25 hp spindle drive motors. Spindle speeds ranging from 36 to 1240 rpm can be obtained in machines equipped with the 5 hp motor, while both the 10 hp and the 25 hp spindle drive motors provide spindle speeds from 72 to 2480 rpm. Ekstrom, Carlson & Co., Dept. M-3, 1400 Railroad Ave., Rockford, Ill. Use ACTION Card, opposite page 64. Eneirtle No. 37

Special purpose adapter-type pickups developed surface finish instrument

Six new accessories to adapt it for special applications have been developed for the Brush Surfindicator, an instrument for measuring surface finish roughness.

Used with the general purpose pickup Model BL-111, these six attachments, plus the motor drive Model BL-114, provide a method of measuring surface roughness claimed to include





nearly every purpose related to this field.

The small bore adapter, Model BL-113, extends the range of the general purpose pickup down to internal diameters as low as ½", including gear teeth and other limited access areas. It will penetrate a ½" i.d. to a depth of 3/16", and a ¾" i.d. to a depth of two inches.

The chisel stylus adapter, Model BL-130, is designed for measuring cutting edges, or very small outside diameters where the usual conical stylus cannot operate.

The minimum clearance adapter, Model BL-131, has a modified small bore with minimum snout dimensions. It can be used in a slot as narrow as 0.05", as low as 0.085", and will measure within 0.010" of a shoulder. For very small areas, it may be necessary to extend the plane of the measured surface by means of a jig.

The hole bottom adapter, Model BL-132, is designed for measuring the bottoms of holes, slots, or counterbores. It can measure the bottoms of slots and holes as small as %" to a depth of one inch, and with diameters of three inches or more to a depth of two inches.

The rough finish adapter, Model BL-133, is designed for castings, rough plastics, concrete, and other relatively rough surfaces. It covers a range of roughness from 250 MU. IN. AA to 10,000 MU. IN. AA at roughness width cutoffs of 0.030", 0.100", and 0.300". A Caliblock replica of an 800 MU. IN. AA machined surface is included for calibration purposes.

The hand-held small bore adapter, Model BL-134, is intended for use in small bores, gear teeth, slots, or anywhere that hand-held operation is desirable or necessary. It will penetrate a ¼" i.d. to a depth of two inches. Brush Electronics Co., Dept. BB, 3405 Perkins Ave., Cleveland 14, Ohio.

Use ACTION Card, opposite page 64. Encircle No. 38



Contour milling machines combine 360° trace with twist of spindle

Latest model Bridgwater contour milling machines combine 360° trace with angular twist of the spindle. They are claimed to reduce the time and cost of milling profiles requiring gradually changing angles of the machined surfaces.

Two types of the machine are offered. The R310, having a rectangular-shaped work table available in lengths up to 20-feet, and the CD72, with a circular work table 72" dia.

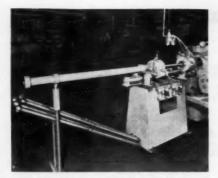


Tracing motions make use of new system of hydraulic control. The guiding brain of this system is a tape cam made of DuPont Mylar, a stable plastic material. Fabricated into an endless belt, this cam, having the template form of the piece to be milled, guides the stylus which actuates the hydraulic trace valves. This method eliminates the need for a separate template table, and makes it possible for an operator to control all cutting motions from his station near the workhead and spindle. Cutting the template form into the cam belts is done by the machine itself. Bridgwater Machine Tool Co., Dept. MTB. Akron. Ohio. Use ACTION Card, opposite page 64, Encircle No. 39

Automatic air stock feed and collet operating unit

An automatic air stock feed and collet operating unit feeds bar, hex or tubing stock to machine—rotating or non-rotating mechanism. Designed to operate with any type of collet equipment, it consists of three main assemblies. These are: stock tube, filler tubes and stock tube support; air operated feed





Precision instrument lathe

The Model No. 750 watch maker and precision instrument lathe has a ball bearing headstock with a runout of less than .0001 a half-inch from headstock. It is equipped with lever collet closer, V-belt, six-position turret, double compound slide rest with rack and pinion cross slide and a front tool post swinging 360°. F. W. Derbyshire, Inc., Dept. MTB, 157 High St., Waltham 54. Mass.

Use ACTION Card, opposite page 64. Encircle No. 65

chuck and feed chuck base; and heavyduty, high rpm rotating air cylinder of "donut" design.

Stock up to 25%" dia. can be accommodated. Feed length is adjustable from 0 to 15". One valve controls the entire operation. Erickson Tool Co., Dept. B, E. 23rd and Hamilton, Cleveland 14, Ohio.

Use ACTION Card, opposite page 64, Encircle No. 40





ARDCOR 11/2-F ROLL FORMING MACHINE with two 30-TON ARDCOR PRESSES performing pre-notching and cut-off operations.



Roll Forming equipment completely designed, engineered and manufactured by one highly experienced seurce. RESULTS: ARDCOR Integrated "Package" Installations consistently prove this advantage with precision forming at modern high speeds—better roll formed products! Consultation without obligation.

Engineered

ARDCOR ROLL FORMING MACHINES

American ROLLER DIE CORP.
29560 Clayton Avenue Wickliffe, Ohio

DESIGNEES AND MANUFACTUREES: All Sizes and Spindle Dismesers of Reil Fenning Mushines, Welded and Luck.
Seem Tube Mills - Forming Rolls, Tubing and Pipe Rolls - Straightening, Pinch and Leveller Rolls - Conself Machines

Encircle No. 483 on Card, Opposite Page 65

ARDCOR

Heavy Duty Bed Type Milling Machines

A new line of heavy duty bed type milling machines-Hypowermaticshave recently been developed by the Cincinnati Milling Machine Co., Dept. BB, Cincinnati 9, Ohio. The machines are equipped with automatic two-way table feed cycles and infinitely variable feed rates, and are designed for continuous operation on medium to larger size parts. Heavier and more powerful than the superseded models, they offer increased cutting capacity (up to 50 hp) and higher spindle speeds (up to 2000 rpm) for taking conventional milling or climb milling cuts with either high speed steel or sintered carbide milling cutters.

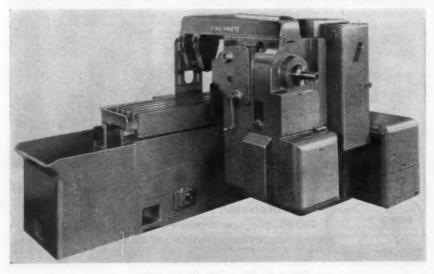
Standard machines, the 300, 400 and 500 Series, are built in plain and duplex styles in 42 sizes of each, from No. 307-183 (36" table travel, 7½ hp) to No. 550-2614 (168" table travel, up to 50 hp.). The bed ways are long, hardened and ground to an accurate bearing with the sliding table. Ways are square gibbed

Machines are provided with inter-

mittent, dog controlled automatic table cycles. Feed rates may be infinitely varied throughout their complete range of 1/4" to 100" or 150" per minute (depending upon machine size), by means of feed rate selector dial. The table is driven by a new type of unit, Hydramech, enclosed within the bed where it is protected from dust and grit. It consists primarily of a hydraulic motor, with an infinitely variable arrangement, driving a worm and dual worm wheel which in turn drives twin vertical pinions engaging the table rack. Antifriction bearings throughout and automatic pressure lubrication system assures long life and trouble-free service.

Sixteen spindle speeds can be obtained through change gears and a back gear combination. A choice of nine ranges of spindle speeds are available. The highest group ranges from 50 to 2000 rpm for 300 Series spindle carriers, 30 to 1200 rpm for 400 Series spindle carriers and 20 to 800 rpm for 500 Series spindle carriers.

Use ACTION Card, opposite page 64. Encircle No. 31



TOOLMAKERS! NOW SET-UP FASTER - -

Save time on intricate, angular set-ups with the fully universal MASTER MULTI-SWIVEL VISE. Three swivels instantly set any compound angle. Used worldwide. Interchangeable platens optional. Write for Circular

DONOVAN MFG. CO. 82A Batterymarch St. Boston 10, Mass.

Encircle No. 486 on Card, Opposite Page 65



Many purpose air press series

Price Machine Products, Dept. B, 929 W. 80th St., Los Angeles 44, Calif., has announced a series of Paragon air presses ranging in capacity from ¾ to 2 tons. Designed for press-fit assembling, marking, forming, staking, light stamping and similar successive operation jobs, these presses permit the operator free use of both hands.

The press features: 5" long side thrust resisting bearing, heavy-walled brass cylinder which is unaffected by moisture in line, removable base with large ground surface area to facilitate fixture mounting, and a press body of two piece construction which permits unlimited extension of table to ram height.

A unique optional feature is a series of self-aligning sub-presses which, when used with the Paragon air press, permits instant setups and setup changes. Merely placing the sub-press





CAM MILLING

Fully equipped modern machine shop with extensive Jig Boring, Surface Grinding, Horizontal Boring and Thread Grinding facilities as well as modern Cam Milling and Cam Grinding equipment.

Your Inquiries Answered Promptly

HIMOFF MACHINE CO. INC. Long Island City 1, N. Y 23-22 44th Road

Encircle No. 488 on Card, Opposite Page 65

IG BORING

Large Precision Machining Done to your specifications

WE HAVE 13 JIG BORERS

KIDDE PRECISION TOOL CORP. 37 FARRAND ST. BLOOMFIELD, N. J.

Encircle No. 490 on Card. Opposite Page 65



Super Sensitive Hand Tapper Mith exclusive fea-tures sets new standards for as-curacy, time and taps saved. Capac-ity No. 0 to %". Write for name of stocking dealer in stocking dealer in your area for free demonstration.

Lassy Tool Co. Encircle No. 492 on Card, Opposite Page 65



Sure Grip Step Blocks and Stud Sets Clamp Assemblies at lew prices.

TIETZMANN TOOL CORPORATION DEPT. C. T. ENGLEWOOD, OHIO

Encircle No. 494 on Card, Opposite Page 65

MAKE HARDNESS TESTS With The KING PORTABLE BRINELL

Puts a load of 3000 kg. on a 10 mm ball. Can be used in any position — even upside down. Removable test head adwn. Removable test head for testing very large parts. Guaranteed to make accurate Brinell tests. Throat: 4", gap 10", wt. 26 lb.

Box 606-H Ardmore, Pa.



Encircle No. 489 on Card, Opposite Page 65



Encircle No. 491 on Card, Opposite Page 65



THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD Your business letterhead will bring literature WATTS BROS. TOOL WORKS Wilmerding, Pa.

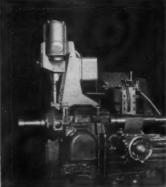
Encircle No. 493 on Card, Opposite Page 65



costs on any tool with a Morse Taper (sizes I to 6) rods of leading industries save money on drills, reamers, countersinks, cutters, drivers, the Mil-TAMS way delivery. Send for prices-or send tools for NO WELDING! NO SLEEVES!

NO SHORTENING! NO DISTORTION! GUARANTEED We return th us like this! STRONG AS NEW! like this!

NU-TANGS INC. 133) Bates Avenue Encircle No. 495 on Card, Opposite Page 65



Above is shown a 6M Fen Automatic Wrench on a thread miller.

For detailed information regarding the application of the Fen Automatic Wrench to your machines, phone, wire or write.

Encircle No. 496 on Card, Opposite Page 65

THE FEN Automatic WRENCH

The Fen Automatic Wrench is a self contained variable torque drive. With the variable torque feature the gripping pressure can be preset and thereby control distortion of the work piece.

These units are now being used to operate chuck or fixtures on turret lathes, thread millers, boring mills of the single spindle type, as well as, single and double index type, also automatic indexing machine, etc.

THE FEN MACHINE COMPAN 28914 Lakeland Blvd. Wickliffe, Ohio

under the ram of the air press constitutes a complete job setup. Setup changes are made by simply switching sub-presses.

The Paragon press comes in four models having cylinders of 4", 5", 6" and 7" bores. The power factors of these cylinders are 12.56, 19.63, 28.8 and 38.47 times air line pressure respectively.

The following specifications are the same for the three larger models: 3" stroke, 34" ram, 61/2" depth of throat, 9" table to ram height. The smallest cylinder (4" bore) is mounted on a lighter and slightly smaller frame.

Use ACTION Card, opposite page 64. Encircle No. 41

New steel cutting grades of cemented carbides

The Carmet Div. of Allegheny Ludlum Steel Corp., Dept. B, 2020 Oliver Bldg., Pittsburgh, Pa. has announced the development of two types of cemented carbides for use in the machining of steel. The new grades replace older grades at no extra cost.

A new anti-cratering ingredient called Crystalloy is claimed to give superior performance in tungsten-titanium carbide steel cutting grades. In producing Crystalloy material, titanium metal is used in place of titanium dioxide as a basic raw material, Greater impact strength combined with maximum crater resistance is reported to be obtained. Throughout the new 600 series, the last two digits of a particular grade designation indicate the cobalt content, as an approximate index of the type of service for which the grade is intended. The new grades are available in all standard cutting tips and tools, and can be made any special blanks of any shape or size required.

CA-610 is designed for use where breakage is the factor limiting tool life. It is claimed to allow the operator to use a lower surface speed and a greater



DRAW-IN COLLETS

Stocked in all standard styles...checked 25 times against master gauges... guaranteed to run "dead true" at collet mouth. Write for Bulletin 100.



THREAD TOOL

No operator skill required to produce perfect threads. Duplicates threads without gauging. Mounts on any screw-cutting lathe. Write for Bulletin 110.



LOCKJAW

Set-ups stay put! Grips both downwards and sidewards... eliminates bolting and clamping. Used on all table top machine tools. 2 sizes available.
Write for Bulletin 140-A.



LATHE & GRINDER, Inc.

Dept. MTBA5

Brighton 35, Boston, Massachusetts

Encircle No. 497 on Card, Opposite Page 65

depth of cut with heavier feeds.

CA-608 is recommended for light machining and finishing where the conditions limiting tool life are edge wear and cratering.

Use ACTION Card, opposite page 64. Encircle No. 42

New packaging for taps

Besly high speed and carbon steel taps in 0-80 through 5/16" sizes are now being packed in a polyethelene plastic container. The container, which is the same size and shape as certain cigarette boxes, is said to be much more durable than the cardboard boxes formerly used. It is oil and grease resistant, can be easily cleaned and will not deteriorate with age or use. A filler of plastic Styrofoam inside holds the taps firmly in position to prevent movement and damage during shipment and storage.

Different colors for the containers identify the various types of taps: orange for high-speed ground thread; red for high speed cut-thread; white for carbon steel. When the container is empty, it makes an excellent storage box for screws, washers, fish-hooks, cigarettes, etc. Besly-Welles Corp., Dept. B. Beloit, Wis.

Use ACTION Card, opposite page 64. Encircle No. 43

Independent variable spindle speed and feed control in lathe

Push button infinite spindle speed control and an independent electric carriage and cross slide are offered together in the Model HLV high speed tool room and production lathe. Spindle speeds are controlled from a push button control box located over a redesigned headstock and allows any speed between 125 to 3000 rpm to be chosen by pressing the "faster" or "slower" button. Exact spindle speed is indicated at all times on the control box. Rate of carriage and cross slide feed is controlled independently from the spindle speed by a variable electric



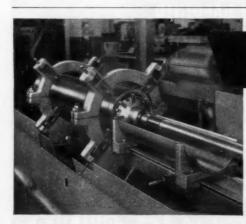
feed control box on the right end of the lathe. Machine does not have to be stopped to make changes in either speed or feed. A lever operated collet closer provides fast collet regulation and instantly adjustable collet tension throughout the full range from light to heavy holding power. Fully enclosed headstock features a large 1-1/16" collet capacity with a 5C collet. The pre-loaded ball bearing spindle eliminates end and radial play and is permanently lubricated to operate continuously without attention. Hardinge Bros., Inc., Dept. BB, Elmira, N.Y.

Use ACTION Card, opposite page 64, Encircle No. 44

Power saw for high-speed steel band

A power cut-off saw designed for the Demon high speed steel saw band is available with either manual or automatic stock indexing. Standard automatic indexing affords production of blanks up to 24" long. With slight modification automatic indexing for blanks of any reasonable length can be provided. Saw is claimed to have extra rugged, steel box-frame construction. and extra horsepower and speed.

Automatic feed pressure control maintains pressure of blade against work at value set by operator, automatically compensates for greater resistance as saw encounters thicker cross-sections. Cutting efficiency is ob-



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You can save time and costs by sending your difficult bored and honed requirements to specialists in internal machining. The very latest in equipment and most exacting testing methods assure high quality. Send drawings for estimates.

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AMERICAN HOLLOW BORING CO. 1955 Raspberry St., Erie, Pa.

RECISION INTERNAL MACH

Encircle No. 498 on Card, Opposite Page 65



tained on all structural forms ranging from thin-wall tubing to heavy bar stock.

The variable speed ranges from 90 to 350 feet per minute. Blade tension is automatically maintained at the proper level for efficient cutting and reasonable tool life.

The machine accepts rounds up to 12"

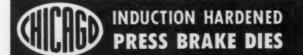
dia. and rectangular or square bars up to 12" x 20" (up to 12" x 12" on the automatic index model). Squareness of cut to axis of bar is maintained within .002" per inch of diameter. DoAll Co., Dept. BB, Des Plaines, Ill.

Use ACTION Card, epposite page 64, Encircle No. 16

Six-inch utility grinder

Model 648 abrasive belt grinder, for free-hand work such as flat surfacing, squaring, rounding, deburring, chamfering, and polishing metals, wood, glass and plastics, is adjustable to either vertical or horizontal position in only 5 seconds. Its 6" belt is backed by large platen, 6%" x 14\%", and will handle fairly large as well as small pieces. In horizontal position, long pieces overhanging the ends of the machine can be worked.

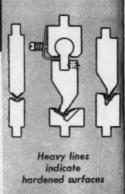
The work table is adjustable to 45° from belt, 20° toward belt, and is slotted for an adjustable angle gage calibrated



for greater die life at no extra cost on any make of press brake

Whether it is a simple die for angle bending or the more complex dies for any of the combined bending and forming operations, Chicago induction-hard-ened dies offer bonus performance at no extra cost. Field reports on these dies show better than ten times the useful life of the conventional dies used in press brakes. Get the full particulars on Chicago dies for your next press brake job.

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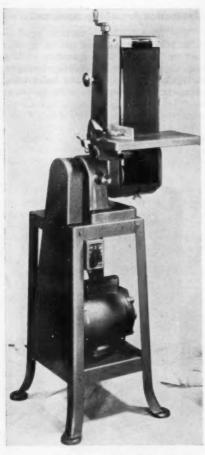




7440 S. Loomis Boulevard, Chicago 36, Illinois

CHICAGO

Encircle No. 499 on Card, Opposite Page 65
MACHINE and TOOL BLUE BOOK



for any angle up to 90°. Belt changes can be made in less than 60 seconds without tilting the idler pulley. A large knob on the side regulates tracking.

Drive units are optional, and include 1 hp, 60-cycle motors in single phase at 110/220 volts, or in triple phase at 220/440 volts. Belt speeds of 2800 and 4000 sfpm are available with a 1725 rpm motor. Engelberg Huller Co., Dept. MTB, 831 West Fayette St., Syracuse, N.Y.

Use ACTION Card, opposite page 64. Encircle No. 45

QUALITY

Depends on

ACCURATE INSPECTION



Accuracy of measurement depends on the precision of the measuring tools. Provide your Shop and Inspection Department with dependable and proper inspection tools. MEEHANITE METAL TOOLS, made to closer tolerances, are furnished in many types.

Surface Plates—Box Parallels
Slotted Angle Plates
Universal Right Angles
Flat Parallels — Lapping Plates
Toolmakers' Knees — "V" Blocks
Straight Edges (Bridge Type)
Straight Edges (Leveling Type)
Measuring Irons
Masterangle Plates
Angle Attachments

Send for Bulletin

ACME TOOL CO.

71 W. Broadway New

New York 7, N.Y.

Single-point presses

Twin geared Steelweld single-point presses of the straight-side tie-rod type are mechanically powered of welded steel construction. They include a low inertia air-operated clutch and brake unit; barrel-type adjustment; non-



metallic, non-scoring guides; automatic lubrication. Air cushions are designed with the cylinder opening downward to prevent foreign materials from working in.

Sizes range from 150 to 500 tons and have bolster areas of 30 x 36" to 42 x 48". Operating speeds are from 10 to 20 strokes per minute. The Cleveland Crane & Engineering Co., Dept. B, Wickliffe, Ohio.

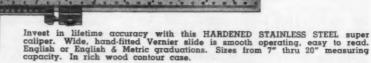
Use ACTION Card, opposite page 64. Encircle No. 46

Production broaching machine

The Model VM215 vertical production broaching machine can be quickly set up and put into operation cutting keyways or square, oblong, hexagon, irregular, splined or round holes using Pioneer stock broaches with the same



precision PLUS.. ETALON No. 10



ALINA CORPORATION • 401 Broadway, New York 13, N.Y.

Encircle No. 501 on Card, Opposite Page 65

precision secured with larger machines, the manufacturer claims. It may also be used for surface broaching operations.

The machine provides up to 2 tons of hydraulic pulling power and 15" of cutting stroke. Complete cutting stroke and return to starting position is cycled in 13 seconds. An adjustable stop is incorporated to automatically limit stroke to actual requirements. Machine is powered by a motorized hydraulic power unit self-contained and base mounted at rear.

Work table surface measures 161/4" x 161/4". Machine height is 42", weight approximately 325 pounds and it requires a floor base area of 18" x 36". including reservoir unit. Pioneer Broach Company, Dept. BB, 6434 E, Telegraph Rd., Los Angeles 22, Calif.

Use ACTION Card, opposite page 64. Encircle No. 47



This new package filtration unit, all-bronze pump, Model 2C is capable of handling up to 9,000 gallons of water per hour allowing deductions of 50% for friction losses. The driving motor is 11/2 hp, 3450 rpm. Ruthman Machinery Co., 1816 Reading Rd., Cincinnati 2, Ohio.

Use ACTION Card, opposite page 64, Encircle No. 48



Encircle No. 502 on Card, Opposite Page 65



any quantity, any material . . . SPUR, BEVEL, WORM, HELICAL, INTERNAL, SPIRAL, RACKS, WORM WHEEL, SPROCKETS...to your specifications. 96 pitch to 5/7 D.P.—¼"P.D. to 18"P.D. ABART SPEED REDUCERS .

75 types and sizes. Specials to order. Write for this pocket-size Abart Reducer



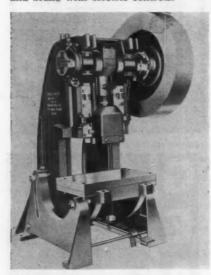
catalog today.

4829 WEST 16th ST. CHICAGO 50, ILL. Encircle No. 503 on Card, Opposite Page 65

Open back inclinable 45 ton press

The heavy duty frame of the No. 45 Press-Rite 45-ton open back inclinable press has built-in high tensile steel tie rods which reduce deflection and increase die life.

Press is available with single stroke safety mechanism, cam actuated automatic brake and four point mechanical clutch, or it may be equipped with Air-flex air friction drum type clutch, and brake with electric controls.



Specifications: standard stroke, 3"; 4" dia. crankshaft at main bearings; maximum stroke, 6", with 2" adjustment of slide; bolster area, 20" x 30". Greater shut height and easy accessibility from front or rear of press for adjustments permit faster setups and use of larger dies. With the mechanical clutch, standard speed is 90 strokes per minute. When equipped with air friction clutch, higher speeds are possible. Press has a 5 hp motor. Floor space is 50" x 45"; over-all height, 69½" from floor to center of crankshaft. Sales Service Ma-

chine Tool Co., Dept. MTB, 2363 University Ave., St. Paul 14, Minn.

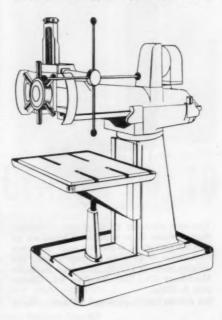
Use ACTION Card, opposite page 64, Encircle No. 51

Turret type radial drill

The 2BR Burgmaster six spindle turret type radial drill claims increased production on bulky pieces as all tools are mounted on machine and are quickly indexed into position. Operator brings the spindle into position over the work, presses one button to lock ram and column and quickly drills, taps, etc.

The unit features: preselective spindle speeds (225-3000 r.p.m.); preselective spindle depth control for each spindle, power index, push button hydraulic clamping, 2 hp motor, 3" drill capacity in steel, maximum radius of 41", minimum radius of 17". Burg Tool Mfg. Co., Inc., Dept. BB, P.O. Box 48, Gardena, Calif.

Use ACTION Card, opposite page 64. Encircle No. 52



High speed drill press for drilling small holes

A precision drill press for production drilling of small parts, the Model P, has sensitive, handy table feed. Table travel is maintained through two separate guide posts.

Wide speed range from 100 rpm to 45,000 rpm allows efficient and sensitive drilling of small holes from .014" to .250" dia. Drill materials include mild steel, aluminum and zinc alloys, brass and copper, glass, plastics, pressed wood and wood.

Long drill life, straight holes and ease of handling are claimed at high speeds because of the accurate, hardened and ground quill and collet chuck. Drill heads are adjustable vertically along steel column and may be turned through 360° for small angle milling operations. Chuck: precision draw collets, range 3/16" to 3/32". Sub-collets, .093" to .014". Chuck to table: 6" max. Max. table lift: 1½" up. Drills to center of 7" circle. Table dia. is 4". Precise Products Corp., Dept. BB, 1350 Clark St., Racine, Wis.

Use ACTION Card, opposite page 64, Encircle No. 50





18 - 4 - 1 Steel

STUB REAMERS

in decimal sizes

For Screw Machines, Turret lathes and Drill Presses are the precise answer to all your special reaming problems. They are ground with perfect accuracy and backed-off to width of land and angle for the material to be reamed; Thus, tailor-made SUPEREAM STUB REAMERS mean extraordinary production efficiency and economy.

WRITE FOR INVENTORY STOCK LISTI Why buy a Decimal reamer as a SPE-CIAL — when you can buy the SUPEREAM DECIMAL REAMERS from stock for immediate delivery.

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applications for this special-lite.
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ROUTE 176 and BRADLEY ROAD BOX 429BB LIBERTYVILLE, ILL.



Encircle No. 504 on Card, Opposite Page 65

INSPECTORS' and CODE SYMBOL STEEL STAMPS...



98 3/6" 98 3/6" 98 5/2"
ACTUAL SIZE OF IMPRESSION

IN YOUR PLANT ... quick identification of inspector, company or part supplier, machine operator, shift, operation, etc.

. . . for the mark of controlled quality on your product.

YOUR CUSTOMERS recognize your inspection mark as a symbol of insured dependability.

Identification numbers from (1) to (99), inside standard ½2, ¾4, ¼4 and ¾6 inch borders. Special sizes and symbols on request.

Write for complete Catalog NM-51.

STEEL STAMPS, INC.

147 Jos. Campau · Detroit 7

Encircle No. 505 on Card, Opposite Page 65

Drilling machine employs automation

A machine which incorporates two independent automatic drilling units, each completely interlocked with an air-operated magazine which is kept filled by the operator or mechanically, drills a .135 hole in a brass part at the rate of 40 pieces per minute.



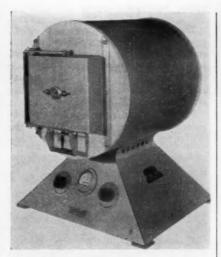
The parts are automatically clamped, drilled and ejected into a chute. By making minor changes, the machine can be adapted to a variety of drilling operations. Govro Nelson Co., Dept. BB, 1933 Antoinette, Detroit 8, Mich.

Use ACTION Card, opposite page 64. Encircle No. 24

Muffle furnace operates at 2300°F

The Alloy 10 muffle furnace for continuous operation at 2300°F. is a self-contained, compact unit with the necessary temperature indicating and control devices located in the pyramid type furnace base.

Temperature is adjusted and main-



tained by the multiple step switches which vary the voltage to the heating coils. The heating coil is formed of Alloy 10 wire and surrounds the heating chamber, offering uniform temperature the entire length of the working space, it is claimed. Hevi Duty Electric Co., Dept. MTB, Milwaukee 1, Wis.

Use ACTION Card, opposite page 64, Encircle No. 58

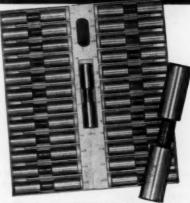
Improved hydraulic feed surface grinders

Two improved hydraulic feed surface grinders have been introduced by Covel Mfg. Co., Dept. 116, Benton Harbor, Mich.

Capacity of Model 20 is 6" x 18" x 12" high under 10" diameter x ¾" face x 3" hole grinding wheel. The No. 35 will handle work 8" x 24" x 11" under a 12" diameter wheel. Infinitely variable table speeds of 10 to 90 fpm are obtained. Three speed interchangeable, ball bearing, quill type spindles are standard equipment.

Improvements are closed hydraulic circuit with pump and motor mounted on top of removable tank, vertical slide ways four inches wider, and saddle

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DELTRONIC Tenth Plug Gauges

save time and material, too!

This new system of precision gauging in sets of 25 provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001" increments and 12 gauges of decreasingly smaller sizes in increments of .0001".

- * Size variation by ten thousandths
- * Available in increments of 1/64" from 1/8" to 1"
- ★ Set of 25 costs approximately same as Go and No Go gauge
- * Hardness is Rockwell C62/C64

For further information write Dept. D.

DELTRONIC CORPORATION 1507 RIVERSIDE DRIVE LOS ANGELES 31, CALIF.

Encircle No. 506 on Card, Opposite Page 65



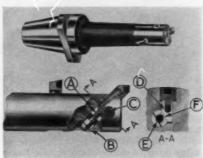
and base column way six inches wider. Both models are 35% heavier than the previous design.

Use ACTION Card, opposite page 64. Encircle No. 59

Micrometer boring tool

The Micrometer boring tool offers several new features. Screw unit is completely enclosed, A, to protect screw from dirt and metal chips. Tool bit is positioned from a seat that is also protected and enclosed in the bar itself, B.

Figure C is a new lock screw that releases the wedge clamp. When the clamp, see Figure D, sectional AA draw-



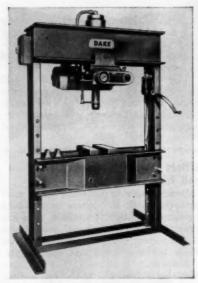


ing of wedge clamp, is loosened, spring insures positive contact between the wedge and tool bit. This holds the tool bit from turning when the dial is being adjusted. Figure E shows the eccentric hole in the wedge which prevents the wedge from turning, thus allowing easier insertion of the tool bit. Wedge clamp angle, Figure F, securely locks the tool bit.

Tool adjustment and clamping can be made from the most accessible operating position with one hand. The Portage Double Quick Tool Co., 1037 Sweitzer Avenue, Akron 11, O. Use ACTION Card, opposite page 64, Engircle No. 60

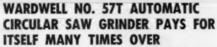
Electric hydraulic shop press

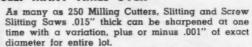
An electric-hydraulic shop press features a rapid ram approach which eliminates the use of a hand wheel. When the control knob is turned, the ram advances at high speed until it comes in contact with the work, then automati-



cally changes to the power stroke. Speed of the ram is variable from zero to

SAVE YOUR CIRCULAR SAWS!





Automatically indexes the gang of saws, one row of teeth at a time.

Steady, accurate, durable. Grind either wet or dry. A time and money saver.

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Maker of Largest Line of Saw and Tool Sharpening Machines

maximum under fingertip control by the operator. The knob automatically turns to "off" when the hand is removed. All controls and gages are placed at convenient working height.

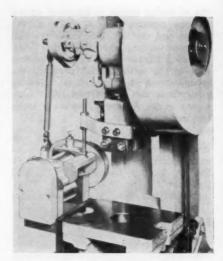
The workhead is self-contained, and is readily movable to center over the work. The ram has a full 10" stroke. Workhead unit may be purchased separately. Dake Engine Co., Dept. B, Grand Haven, Mich.

Use ACTION Card, epposite page 64, Encircle No. 61

Lifters increase efficiency of roll feeds

Benchmaster roll feeds are now equipped with roll lifters as standard equipment. With this addition, rolls are separated slightly after each feed stroke is completed, thus releasing tension on stock between press and coil supply.

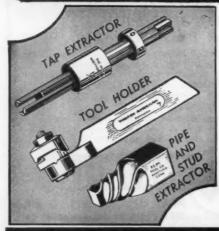
Automatic friction roll feeds are available in 3", 5", 7" and 9" roll widths, in 0 to 3" cut-off and 0 to 6" cut-off stroke lengths. Rolls are plain, knurled



or rubber covered according to demand. Benchmaster Mfg. Co., Dept. BB, Gardena, Calif.

Use ACTION Card, opposite page 64. Encircle No. 32

WALTON SPECIALIZED TOOLS CUT COSTS IN METAL WORKING





TAP EXTENSIONS Added to the WALTON Line of Labor Saving Tools

WALTON TAP EXTENSIONS are valuable for tapping in places where it is difficult or impossible, because of limited space, to turn a tap wrench. Fit all standard taps (4-flute, 3-flute and 2-flute styles) size from No. 10-3/16" to 1" inclusive, Made of special alloy heat-treated steel.

Write for Catalog 10. Free trial offer.

THE WALTON COMPANY, Hartford 10, Conn.

Encircle No. 510 on Card, Opposite Page 65

Tool grinder has profile and tool positioning attachments

A tool grinder equipped with attachments for carbide tipped and high speed steel tools is being manufactured by the Redco Tool Div. of the Red Lion Cabinet Co., Dept. BB, Red Lion, Pa.



The profiler, yoke and profile single tool attachments make the grinder equally effective in re-sharpening standard production tools and making and re-sharpening special types of cutters. The profile attachment with its template and guide enables the maintenance of tolerances as close as .0002" on the cutting edge, it is claimed.

Tool holder permits fast, accurate boring

A new holder for use with Bokum boring tools on screw machines or turret lathes is claimed to permit more accurate and faster boring of holes.

While the holder is engaged in boring, other tools are free to carry on different operations, thus increasing PERFECT ALIGNMENT
EVERY TIME with
ROOFE Heavy Duty
BULL NOSE CENTERS



Two double rows of quality bearings in the large and small ends of the nose of this live center are your assurance of perfect alignment on any type of work.

Two shank sizes provide diameters from ½" to 7½" for a wide range of work with a single center.

Write now for complete catalog of all types of ROOFE Live Centers.

HOUSTON GRINDING and MFG. CO.

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TRADE

AUTOM

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Offset Type

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET AUTO MOULDING & MFG. CO. 1110 E. 87TH ST. CHICAGO 19, ILL. SPECIFICATIONS
Open width ³/₈" to 6"
Gage Material .040 to .125
Pin Diameter .101 to ³/₈
Lengths to 120"

SEMI-OFFSET

Encircle No. 512 on Card, Opposite Page 65



production and reducing setup costs.

Holders are adjustable to boring positions of Vernier accuracy; calibrated scales on top of each. Bokum Tool Co., Dept. MTB, 14775 Wildemere Ave., Detroit 38, Mich.

Use ACTION Card, opposite page 64. Encircle No. 49

Air press develops power to 15 times air line pressure

Speedy air press Model 80 of one ton capacity and capable of developing power up to 15 times air line pressure, has been introduced by the W. R. Brown Corp., Dept. B, 2701 N. Normandy Ave., Chicago, Ill.

This sturdy, rapid-action air press is adaptable to uses such as punching, stamping, stapling, crimping, assembling, clamping, bending, etc. The heavy grey iron frame is claimed to assure column rigidity without breathing. Air ram head is adjustable to two positions; the position of the threaded ram plunger is adjustable up to 2½".

Operating line pressure ranges from 5 to 150 lbs. Ram clearance from 0" to





5" with a %" stroke. Throat clearance to center of 10" circle. Base overall 5½" wide, 13½" long.

Use ACTION Card, opposite page 64, Encircle No. 54

Drill comparator checks small sizes

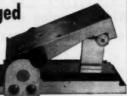
The Matrix optical twist drill comparator checks accurately with optics. A special small projector of 5X magnification, with interchangeable screen to suit individual or standard needs, can be placed at the drill grinder to assure correct angle and centrality of drills 1/16" to 1/4" in diameter. The instrument is equipped with quick-acting locator and focusing knob. Engis Equipment Co., Dept. BB, 431 S. Dearborn St., Chicago 5, Ill.

Use ACTION Card, opposite page 64. Encircle No. 88



5" Hinged Sine Plate

\$109.50



Precision · Convenience · Economy

Exclusive locking device provides a rigid unit for operations such as grinding. May be used with a permanent magnetic chuck. Accurate to .0002" in center distance and parallelism for length of tool.

• Precision ground • Hardened rolls • Tapped holes • End plates • Immediate shipment

BALD EAGLE SINE TOOLS

No.	Center Dist.	Width	Longth	Price with Oak Case
1605	5"+/-0002"	3"	634"	\$43.00
1610	10"+/-0002"	5"	117/9"	\$95.00
1705	5"+/-0002"	1"	6%"	\$25.25
1805	5" + / - 0002"	3"	91/4"	\$100.50

F.O.B. St. Paul.

Order from Your Dealer or Direct



Encircle No. 514 on Card, Opposite Page 65



STEP UP PRODUCTION 20% -

- ... for most lathes to 1" bar stock capacity
- Hold delicate parts without damage or adjustment
- Iron grip for heavy work
- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- · Eliminates jarring of head stock

(Ten day FREE TRIAL to reliable firms)

WILSON AIR COLLET CLOSER, INC. 909 40th Ave. NE, Minneapolis 21, Minn.

Encircle No. 515 on Card, Opposite Page 65

Wire flattening mill rolls close tolerance strip

A heavy duty high speed (up to 2500 fpm) two-stand tandem wire flattening mill processes narrow strip material to thickness and width tolerances as close as plus or minus 0.0001". It was developed especially for manufacturers of such items as flat springs, slide fasteners, resistance elements, and electronic tube components.

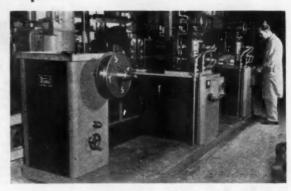
This "package" machine comprises two mill stands and a traversing recoiler mounted in tan-

dem with a dancer roll system to maintain constant wire tension.

Wire flattening is used in both ferrous and nonferrous industries for strip production generally ranging in thickness from .001" to 3/16" and width from 1/64" to %". Stanat Mfg. Co., Dept. BB, Long Island City, N.Y.

Use ACTION Card, opposite page 64. Encircle No. 53

Close-up of second mill stand shows
 dia. x 4" face width rolls, and vertical roller edgers mounted ahead of mill.



 Tandem wire flattening mill comprises two mill stands with dancer roll system between, and recoiler, left, all mounted on one steel base.



Multiple Position Lathe Carriage
PRECISION-STOP

Pays for itself in savings on setup and operational time.

Up to 15 possible positions . . . maintains critical tolerances . . . 3 inch stop bar travel . . . required positions on setup made in seconds . . . all stops full guaranteed.

Write for illustrated leaflet.

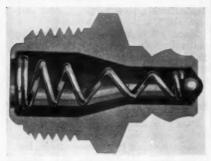
EDWARD JENTSCH, Inc. 15 Penobscot St., Clifton, N.J.



Encircle No. 516 on Card, Opposite Page 65

Grease fittings keep out dirt

Surfa-Chek grease fittings, offered in a complete selection of styles and sizes, have ball in tip to keep out dirt and other foreign matter which would otherwise cause damage to bearings. Volume flow results from enlarged inner passage which admits more lubricant and helps cut time on important lubrication jobs. A balanced action spring retracts easily to allow maximum lubricant flow under



pressure, yet holds ball firmly in sealing position at other times.

Spherical shape of base allows coupler jaws to form leakproof seal, even at a wide angle. Concave shaped head permits easier disconnection of coupler jaws, which reduces wear on jaws and fittings. All threads are accurately machine-cut for installation ease. Aro Equipment Corp., Dept. B, Bryan, Ohio. Use ACTION Card, opposite page 64, Encircle No. 80

Valve line expanded

The Bellows Co., Dept. B, Akron 9, Ohio, has expanded its heavy-duty Bel-Air valve line to include a 3-way series as well as the 4-way models recently introduced. Standard 3-way models are available in sizes of 1/4", %" and 1/2" for manual or electrical control.

Solenoid - controlled, pilot - operated models offer a choice of 115, 230, or 440 v. operation. The same solenoid is used on all sizes.

Mechanically actuated models include





Powered by the press ram... independent of the die

2 SIZES Cuts steel up to 1/4" thick

6"WIDE 3"WIDE

Guaranteed - money back if not 100% satisfied

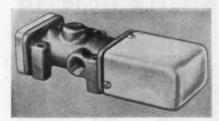


WRITE FOR FULL DETAILS TODAY!

Dealer Inquiries Invited

JACO DEVICES, INC. HINGHAM, MASS.

Encircle No. 518 on Card, Opposite Page 65

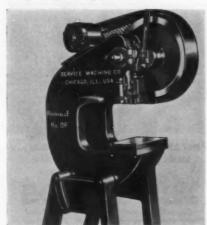


hand lever, clevis, roller, foot pedal, and treadle types. All actuators are interchangeable between valves of similar size. A torsion spring in the lever bracket returns the valve when pressure is released.

Use ACTION Card, opposite page 64. Encircle No. 81

Five-ton o.b.i. punch press has deep throat, ample die space

Rousselle Model O.F. 5-ton open back inclinable punch press features a 9" throat. The double wall frame has a 6" opening through the back.



Flywheel operates at a speed of 250 rpm. Die space is 7½", standard stroke 1¼", floor or bench model. Service Machine Co., 7629 S. Ashland Ave., Chicago 20.

Use ACTION Card, opposite page 64. Encircle No. 82

Drills for tough jobs

Heavy duty T. S. Drill Type No. 710 heavy duty drills are claimed to be designed for top performance in tough and hardened materials such as heat



treated steels, steel forgings, steel castings, etc.

Made of high speed steel, quality controlled, size range \(^{1}\text{s''}\) through \(^{1}\text{2''}\) diameters. Chicago-Latrobe, Dept. BB, 411 W. Ontario St., Chicago 10, Illinois

Use ACTION Card, apposite page 64. Encircle No. 96

Hacksaw frames

Two Star hacksaw frames of simplified design, No. 10 and No. 15, have been introduced by Clemson Bros., Inc., Dept. MTB, Middletown, N.Y. Model 10 is fitted with a 12" unbreakable flexible blade, Model 15 with a 12" Moly high speed blade.

A cam-action lever on the bottom of the handles applies correct blade ten-



sion, changes blades, and readjusts the frames to fit 10" blades. The frames themselves are a single piece of heattreated steel to which Tenite handles are molded.

Use ACTION Card, opposite page 64. Encircle No. 97

Special Taps

IN STOCK FOR IMMEDIATE SHIPMENT

HIGH SPEED RIGHT

SIZE	THREAD
4	32-48-60-64
5	30-32-35-48-80
6	36-40-48-56-60
7	32-40-48
8	24-30-36-38-
	40-44-48
9	24-28-32-40-48
10	28-30-36-40-48-64
12	20-28-32-36-48
14	20-24-28
1/16	60-64
5/84	36-48-72
3/32	48-56-60
7/64	48-56-60
1/8	32-40
5/32	32-36-40-48
9/64	36-40-48
11/64	36
3/16	20-24-32
13/64	32-36-48
7/32	24-28-32
1/4	18-24-26-27-
	30-32-36-40-48
5/16	16-20-22-27-
-,	28-32-36-40
3/8	12-16-18-20-27-28-32-
	36-40-48
7/16	12-16-18-22-24-27-28-
.,	30-32-36-40
1/2	12-14-16-18-22-24-26-
.,-	27-28-30-32-36-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-18-20-24-27-28-32-
-,-	36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-18-20-24-26-
47.4	27-28-32
13/16	10-14-18-20-27-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-8/8	8-19-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24
1-9/16	18-20-24-36
	51/4-8-10-12-13-16-18-20-24
1-5/8	

We Specialize In High Speed Cutting Tools SPECIAL PRICES TO DEALERS

	HIGH		
1-3/4 1-13/16 1-7/8 1-15/16 2 2-1/16 2-1/8 2-3/16	8-10-12-14-16-18-20-24-16-18-20-24-16-18-20-24-16-18-20-24-12-14-12-16-18-20-24-12-16-18-20-24-12-16-18-20-24-12-16-18-20-20-12-16-18-20-20-12-16-18-20-20-12-16-18-20-20-12-16-18-20-20-12-16-18-20-12-18-20-18-20-1	-28	2-1/4 2-8/16 2-3/8 2-1/2 2-9/16 2-5/8 2-3/4 2-7/8 3-1/4 3-1/2 3-7/8
	0 10 10 11		0.14

TAPS

4½-8-12-14-16-18 12-18 12-18-18 8-18-12

8-12-16 8-16 8-12-16 8-12

SIZE	THREAD	SIZE	THREAD
0	80	11/16	11-16-24
Ĩ	56-64-72	3/4	10-16-18-20
2	56-64	13/16	16
3	56	7/8	9-12-14-18-20
4	32-36-40-48	11	8-12-14-16-18-20
5	40-44	1-1/8	7-12
6	32-36-40	1-1/4	7-12-16-18
8	32-36-40	1-3/8	6-8-10-12-16-18-
10	24-30-32-40		20-24
12	24-28-32	1-7/16	8-10-12-14-16-18-20
1/4	20-28-32	1-1/2	6-8-10-12-15-18-20
5/16	18-20-24-	1-9/16	8-10-12-16-18-20
	28-32	1-5/8	8-10-12-14-16-18-20
3/8	16-24-32	1-11/16	8-10-12-14-16-18-20
7/18	14-29-28	1-3/4	8-10-12-14-16-18-20
1/2	12-13-28-28	1-13/16	8-18-12-14-16-18-20
9/16	12-18-20-24	1-7/8	8-10-12-14-16-18-20
5/8	11-12-18- 20-24	1-15/16	8-10-12-14-16-18-20 4½-10-12

DIES IN STOCK PRICES ON APPLICATION NEW SIZES ADDED FREQUENTLY

LEFT HAND AND SPECIAL

NOTE: Oversize tops. Special size reamers.
H. S. extension drills. H.S. Taper length drills No. 1 to No. 60—Letter sizes
A. to Z. Fractional sizes ½" to ½", 12"
Overall 9" flute length. H.S.S.S. aircraft drills 6" and 12" long.

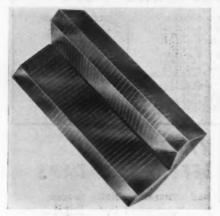
WESTERN TOOL SUPPLY COMPANY

617-19 W. Randolph St., Chicago 6, Ill. PHONE: RAndolph 6-4113

MONTHLY BULLETINS AVAILABLE -

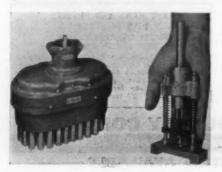
Magnetic parallels and V-blocks

Standard magnetic parallels and V-blocks, for holding irregularly shaped pieces on a magnetic chuck, are all-steel welded construction with alternate laminations of 1/32" non-magnetic steel



and 1/8" low carbon steel which cannot shift. There are no rivets or dowels, no plastic or soft filler. Surfaces are precision-ground parallel and square. With standard size Magna-Lock parallels, tool rooms can make their own grinding fixtures, it is claimed.

On the V-blocks, available in 90° and 45° from center, the V is ground parallel and centered to the base and



wat it is the

ends are ground square. Hanchett Magna-Lock Corp., Dept. P-650, Big Rapids, Mich.

Use ACTION Card, opposite page 64. Encircle No. 30

Tools bore short precision holes

For boring short precision holes, the 500 Series of short-neck boring tools feature a neck length which is slightly greater than the boring depth. This is claimed to contribute maximum rigidity throughout the tool length and permit



the operator greater precision control during boring operations.

Tools are available in two types—Style A for through boring and Style B for bottoming—each obtainable in 25 different sizes, high speed steel or carbide tipped. Bokum Tool Co., Dept. MTB, 14775 Wildemere Ave., Detroit 38, Mich.

Use ACTION Card, opposite page 64. Encircle No. 89

Two examples of the Root line of custom made multiple spindle drill heads. At left is a 200 lb. unit measuring 32" x 15", made for drilling 28 holes in an air compressor body. Head at right weighs about 1½ lb. and drills four holes on a .450" dia. circle plus a center hole. B. M. Root Co., Dept. MTB, 421 S. Sherman St., York, Pa.

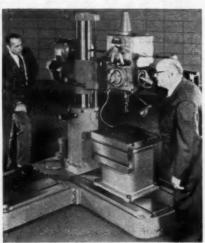
Radial drill has flame-hardened column

The Hardclad radial drill, which is claimed to be the first to have a flame-hardened column has been announced by Cincinnati Lathe and Tool Co., Dept. BB, Cincinnati 9, Ohio. The process was researched in the company's laboratories to find a way to retain built-in accuracies and prevent column scoring.

The column is a thick-walled, certrifugal casting, finish ground to close tolerances and a mirror-like finish. Drill features two-lever, direct-reading, spindle speed and feed shift dials. All controls are grouped within easy reach of the operator.

An alloy steel, No. 3 Morse taper spindle is mounted in four-antifriction bearings of ample capacity. Nine spindle speeds and six power feeds are provided. All speed and feed shafts are mounted in anti-friction bearings. The entire internal mechanism is forced-spray lubricated by an oil pump.

The 1½ hp main drive motor is mounted on the arm to the left of the column, providing counter-balance and easy accessibility. Power is transmitted



through a chain drive shaft, and no parts of the main drive arrangement are concealed in the head. Radial is a 3' arm, 7½" column machine with a drilling capacity of 1½" in cast iron, and it drills to the center of a 77" dia. circle.

Use ACTION Card, opposite page 64. Engirele No. 55

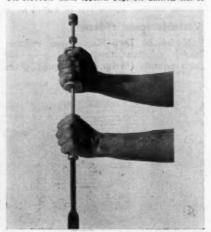
Ram-type portable hammer

A self-contained, portable hammer, operating on the ram principle, has been introduced by E. V. Nielsen, Inc., Dept. MTB, 128 Broad St., Stamford, Conn. Called the Ram-Ex, it requires no air lines or electrical connections; is completely operated by hand.

The chuck has a quick change action to take over 40 tools for chipping, gouging, drilling, rivet busting, cutting, sealing, scaling, caulking, roughing, and other operations.

Any of three size weights may be mounted on the guide rod at the rear of the chuck holder. The weight is held in one hand; the chuck, in the other. Impact is produced by sliding the weight down the guide rod against the rear of the chuck holder. Impact of the stroke may vary from a light tap to a smashing blow.

Use ACTION Card, opposite page 64. Encircle No. 56.



Circular form tool grinding fixture

This new Acorn grinding fixture requires no calculations to operate. Simple settings are all that is needed to resharpen circular cutting tools. Proper relationship between cutting face and centerline of tool, as well as same degree of hook, are maintained at all times, it is claimed.



The fixture adapts to any make of surface grinding machine, with or without magnetic chucks. It can be used to grind with the periphery or the side of the grinding wheel. Pabco Industries Inc., 6943 West Grand Ave., Dept. B, Chicago 35, Ill.

Use ACTION Card, opposite page 64. Encircle No. 71

Variable speed reducer

Model 24 Zero-Max speed reducer has a constant torque rating of 100 inch pounds (¾ hp at 450 rpm), gives



full variable speed from 0 to $\frac{1}{4}$ the input speed. Weight is 25 lb., dimensions $7\frac{1}{4} \times 10\frac{1}{4} \times 6\frac{1}{8}$ inches, including shafts and brackets.

Features include a screw hand-wheel for speed change, 4-way mounting brackets for ease of installation, instant speed change at any time whether running or not. Revco Inc., Dept. MTBB, 2 E. Franklin Ave., Minneapolis 4, Minn.

Use ACTION Card, opposite page 64. Encircle No. 72

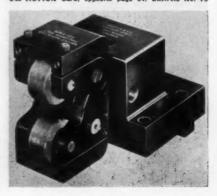
Thread rolling attachment for mass production

A new thread rolling attachment that requires only one adjustment for matching of rolls and just two adjustments to set pitch diameter is manufactured by The Sheffield Corp., Dept. B, Box 893, Dayton 1, Ohio.

Designated the Precision-Rol, it is claimed to roll high precision, close tolerance uniform threads, right or left hand, on automatic screw machines or turret lathes at mass production rates.

Five standard sizes are available, providing thread diameter capacities and roll face widths as follows: 0 to %" dia. by 41/64" face width; 0 to 7/16" -53/64"; ¾ to %"-53/64"; ¾ to 1½" -1½". Each size has an unlimited range of work diameters within its capacity.

Use ACTION Card, opposite page 64. Encircle No. 73





WHY WAIT FOR SPECIAL DRILLS?

. Has them IN STOCK
for IMMEDIATE DELIVERY!

Extra Long Length High Speed Drills—Straight Shank

TAPER LENGTH WIRE GAUGE SIZES

Wire Gauge Nos.	Price Each	Length Overall Inches	Approx. Length of Twist Inches	Wire Gauge Nos.	Price Each	Length Overall Inches	Approx. Length of Twist Inches
1 2 3 4	\$1.00 1.00 1.00 1.00	6 1/a 6 1/a 6	3 ³ / ₄ 3 ³ / ₆ 3 ⁵ / ₈	31 32 33 34	.70 .70 .70 .70	5 1/6 5 1/6 5 1/6 5 1/6	3 3 3 3
5 6 7 8	1.00 1.00 1.00 1.00	6 6	35% 35% 35% 35%	35 36 37 38	.70 .70 .70 .70	5 1/6 4 9/6 4 9/6 4 9/6	3 2½ 2½ 2½ 2½
9 10 11 12	1.00 1.00 .90	6 6	35% 35% 35% 35%	39 40 41 42	.70 .70 .60	4 % 4 % 4 % 4 5/8 4 1/4	2½ 2½ 2½ 2½ 2½
13 14 15 16	.90 .90 .90	53/4 53/4 53/4 53/4	3½ 3½ 3½ 3½ 3½	43 44 45 46	.60 .60 .60	4 1/4 4 1/4 4 1/4	21/4 21/4 21/4 21/4
17 18 19 20	.90 .90 .90	5 ³ / ₄ 5 ³ / ₄ 5 ³ / ₄	31/2 31/2 31/2 31/2	47 48 49 50	.60 .60 .60	41/4 33/4 33/4 33/4	21/4 2 2 2
21 22 23 24	.80 .80 .80	53/4 53/4 53/8 53/8	3½ 3½ 3¼ 3¼ 3¼	51 52 53 54	.50 .50 .50	33/4 33/4 3 3	2 2 13/4 13/4
25 26 27 28	.80 .80 .80	53/8	31/4 31/4 31/4 31/4	55 56 57 58	.50 .50 .50	3 21/4 21/4 21/4	13/4 11/8 11/8 11/8
29 30	.80		31/4	59 60	.50 .50	21/4	11/8

Set \$1--1 ea. \$1-60 Long Drills. Consists of 60 Drills\$40.00 E Set \$2--1 ea. Letter A-Z Long Drills. Consists of 26 Drills 40.00 T Set \$4--1 ea. ½ to ½ Extra Long Drills. 12" Overall, 9" Flute. Consists of 25 Drills x 64ths 55.00

STRAIGHT SHANK 12" LONG 9" FLUTE

Size Inches	Price Each Net	Size Inches	Price Each Net
1/8	.\$1.65	5/16	. 2.25
9/64	1.65	21/64	
5/32	1.65	11/32	
11/64	1.65	23/64	
3/16	1.65	3/8	. 2.75
13/64	. 1.80	25/64	. 3.05
7/32	1.80	13/32	3.05
15/64	1.95	27/64	
1/4	1.95	7/16	
17/64	2.05		3.60
9/32	. 2.05	15/32	
19/64	2.25	31/64	
		1/2	. 3.60

15" LONG 12" FLUTE

17/32	\$7.00	21/32		9.00
9/16	7.70	11/16	*****	9.10
19/32	8.25	23/32	****	9.35
5/8	8.80	3/4	*****	9.50

Taper Length Letter Sizes STRAIGHT SHANK

Size	Price Each	Length Overall Inches	Approx. Length of Twist Inches
A-E	\$1.64	61/8	4
F-K	1.71	61/4	4
L-N	1.78	63/8	41/8
O-R	1.86	61/2	41/2
S-U	2.00	63/4	41/4
V-Y	2.14	7	43/8
2	2.29	71/4	45/8

TAPER SHANK

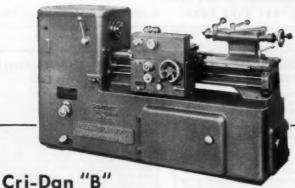
Size	Price Each	Length	Twist	Shank Size	Size	Price Each	Length		Shank Size
33/64	\$7.15	17	13	No. 2 M.T.	47/64	\$ 9.50	17	13	No. 2 M.T.
17/32		17	13	No. 2 M.T.	3/4	9.50	17	13	No. 2 M.T.
35/64		17	13	No. 2 M.T.	25/32	10.20	17	13	No. 2 M.T.
9/16		17	13	No. 2 M.T.	13/16	12.00	18	133/0	No. 3 M.T.
37/64		17	13	No. 2 M.T.	27/32	12.50	18	133/8	No. 3 M.T.
19/32	8.25	17	13	No. 2 M.T.	7/8	13.20	18	133/8	No. 3 M.T.
39/64	8.80	17	13	No. 2 M.T.	29/32	13.75	18	133/8	No. 3 M.T.
5/8	8.80	17	13	No. 2 M.T.	15/16	14.30	18	133/8	No. 3 M.T.
41/64	9.00	17	13	No. 2 M.T.	31/32	15.40	18	133/8	No. 3 M.T.
21/32		17	13	No. 2 M.T.	1	17.60	201/2	157/8	No. 3 M.T.
43/64		17	13	No. 2 M.T.	1-1/16	18.70	201/2	157/8	No. 3 M.T.
11/16		17	13	No. 2 M.T.	1-1/8	19.80	211/2	157/8	No. 4 M.T.
45/64		17	13	No. 2 M.T.	1-3/16	22.00	211/2	157/8	No. 4 M.T.
23/32		17	13	No. 2 M.T.	1-1/4	24.00	211/2	157/8	No. 4 M.T.



Mechanics Through The Ages



Threading Problem? Here's the answer!



single-point threading machine

Rugged, versatile and FAST, the Cri-Dan threading machine will consistently produce class 3 threads from 8 to 40 TPI, right or left-hand, single or multi-start, internal or external.

Production runs? Semi-automatic operation makes them a cinch! Job lots? 15 minute change over and simplicity of tooling cut your costs on small lot runs, too!

Get the full story—call your local Lees-Bradner representative. Or write us direct.

CRI-DAN DIVISION

The LEES-BRADNER.

CLEVELAND 11, ONIO, U.S.A. COMPANY



Advertisements acceptable in THE MARKET PLACE include those for employment, sales services, production facilities, representation and related needs. Rates: \$20 per column inch per insertion. Maximum size advertisement accepted in this section is three inches.

Copy should reach us by the first of the month for next month's issue.

MACHINE and TOOL BLUE BOOK

A Hitchcock Publication

Wheaton, III.

EARN \$1000 MONTH AS TOOL, DIE DESIGNER

Tool and die designers are in demand—and Acme is the only school in America offering complete tool and die design training—Acme graduates step right into responsible, high-paying positions. NOW you can take the same course taught in our resident schools by CORRESPONDENCE in your spare time. Training made sure and easy through our famous Cope System. If you can finish high school, you can master this profession! Prepare for a career in an \$8000-\$15000 yearly salary bracket—write today to ACME SCHOOL OF DIE DESIGN, Corres. Div. BB, 8 N. Jefferson Street, Dayton 2, Ohio. Approved under PL550 for Korean Veterons training.

Encircle No. 522 on Card, Opposite Page 65

SALES REPRESENTATIVES WANTED

Two sales representatives wanted by a manufacturer punch proses, power shears and small milling machines to call on machine tool dealers. The men selected will receive factory training. One man required for the mid-west area who probably lives in Chicage er vicinity and one man for the East Coast who probably lives in Now York or Philadelphia. Must have experience in machine tool or sheat metal machinery sales. Knowledge of direct mail advertising helpful. Duties include training dealers' salesmen and selecting aggressive dealers in areas in which we are not properly represented. Salary expenses and commission or hours. Send complete information to

PICO, CALIFORNIA

Encircle No. 523 on Card, Opposite Page 65



Encircle No. 524 on Card, Opposite Page 65

Make your own Storage & Pallet Racks



with Amidon Fittings and one inch pipe.

Amidon Engineering Co. ELYRIA 10, OHIO

Encircle No. 525 on Card, Opposite Page 65

THREAD GRINDING

Open Time Available

WARD THREAD GRINDING CO. 265 Howard Ave. Bridgeport 5, Conn.

Encircle No. 526 on Card, Opposite Page 65 354

"KNOW HOW & SHOW HOW"
Machine Tool Reconditioning
and the Art of Hand Scraping

Illustrated

Write today for folder describing book

Machine Tool Publications 215 Commerce Bldg. East 4th St. St. Paul 1, Minn.

Encircle No. 527 on Card, Opposite Page 65

MACHINE and TOOL BLUE BOOK

Tap extension for difficult operations

A tap extension for difficult machining operations has been designed by the Ritmar Corp. Dept. B, 183 New York Ave., Huntington, New York, to facilitate tapping operations with regular taps where access is limited by obstructions.

The extension is proportioned to hold a single size of tap and the maximum diameter of the extension (The o.d. of the collar which applies the clamping



action on the tap) is not more than twice the diameter of the tap shank.

A square hole inside the tap-holding end of the extension transmits the necessary driving torque to the square end of the tap, insuring positive tapping and retracting action with either right or left threads, it is claimed. Worn or broken taps can be replaced without the use of tools of any kind. Taps may be replaced without removing the extension from the tapping machine. Suitable for either production machine applications or hand tapping work. They are available for tap sizes from No. 10 upward.

Use ACTION Card, opposite page 64. Encircle No. 84



HARTWYK MFG. CO.
BOX B
3609 Glenwood Ave., East Orange, N.J.

Encircle No. 528 on Card, Opposite Page 65

PRECISION INSTRUMENT

Indicators - Micrometers - Comparators Precision Levels - Dial Bore Gauges

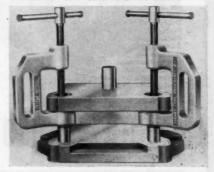
W. HOOPMANN & CO. 5948B Navarre Ave. Chicago 31, III. ROdney 3-6794

Encircle No. 529 on Card, Opposite Page 65

Die set pullers have built-in handles

The Durant Shur-Pull die set pullers are designed to separate medium and large sized die sets with a minimum of effort. The built-in handles add to their efficiency. Sliding adjustment bar affords easy operation. Durant Tool Supply Co., Dept. MTB, 136 South Water St., Providence, R.I.

Use ACTION Card, opposite page 64, Encircle No. 66



Whatever You Need, You'll Find It Here

A

Abrasive Cloth, Paper, Belts, etc., 40, 68, 319 Paper, Discs, Wheels, Stones, Abrasive Cutting Machines 86 Adapter, Sleeve, 62, 233 Adapters, 127 Air Cylinders, 63 Air Filters, 195 Air Ejection Sets, 63 Air Grinders, 315 Air Line Couplers, 63 Air Strainers, 63 Air Tools, 66 Alloys, 154, 291 Angle Attachments, 331 Angle Bending Rolls, 56 Angle Dresser, 322 Angle Plates, 265, 331 Angles, 56 Arbor Spacers, Shim Stock, 127, 239 Arbors, 127

B

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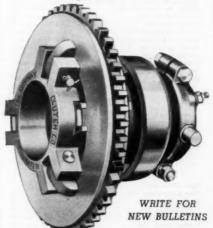


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